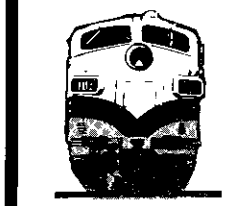
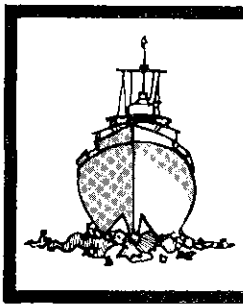
PB88-916305

NATIONAL TRANSPORTATION SAFETY BOARD

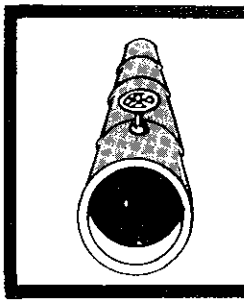
WASHINGTON, D.C. 20594





RAILROAD ACCIDENT REPORT

COLLISION AND DERAILMENT
OF AMTRAK TRAIN 6
ON THE BURLINGTON NORTHERN RAILROAD
RUSSELL, IOWA
OCTOBER 12, 1987



NTSB/RAR-88/04

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

1 Report No NTSB/RAR-88/04	2 Government Accession No PB88-916305	3 Recipient's Catalog No
4 Title and Subtitle Railroad Accident Report--Collision and Derailment of Amtrak Train 6 on the Burlington Northern Railroad, Russell, Iowa, October 12, 1987		5 Report Date July 19, 1988
		6 Performing Organization Code
7 Author(s)		8 Performing Organization Report No
9 Performing Organization Name and Address National Transportation Safety Board Bureau of Accident Investigation Washington, D C 20594		10 Work Unit No 4760A
		11 Contract or Grant No
		13 Type of Report and Period Covered Railroad Accident Report October 12, 1987
12 Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D C 20594		14 Sponsoring Agency Code

15 Supplementary Notes

16 Abstract

On October 12, 1987, National Railroad Passenger Corporation (Amtrak) passenger train 6, the California Zephyr, derailed in Russell, Iowa, injuring 15 crewmembers and 107 of the 230 passengers The train was operating eastward on the westward track, since the maintenance-of-way department had taken the eastward main track out of service The train was traveling about 60 mph when it entered into a stub track and struck maintenance-of-way work equipment Two locomotive units and 11 of the 14 passenger cars derailed, as well as the maintenance-of-way crane and three flat cars The safety issues discussed in this report include speed of trains through a work area, visibility of mainline switch banners, maintenance-of-way qualifying procedures, management oversight of rules, toxicological testing of maintenance-of-way employees, and crashworthiness of equipment

17 Key Words passenger train, track maintenance, speed, switch, rules, toxicological testing, crashworthiness		18 Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19 Security Classification (of this report) UNCLASSIFIED	20 Security Classification (of this page) UNCLASSIFIED	21 No of Pages 81	22 Price

NTSB Form 1765 2 (Rev 5/88)

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EXECUTIVE SUMMARY

On October 12, 1987, National Railroad Passenger Corporation (Amtrak) passenger train 6, the California Zephyr, derailed in Russell, Iowa, injuring 15 crewmembers and 107 of the 230 passengers The train was operating eastbound on the westward track, since the maintenance-of-way department had taken the eastward main track out of service The train was traveling about 60 mph when it entered into a stub track and struck maintenance-of-way work equipment Two locomotive units and 11 of the 14 passenger cars derailed, as well as the maintenance-of-way crane and three flat cars

The safety issues discussed in this report include

1 Speed of trains through a work area,
2 Visibility of mainline switch banners,
3 Maintenance-of-way qualifying procedures,
4 Management oversight of rules,
5 Toxicological testing of maintenance-of-way employees, and
6 Crashworthiness of equipment

Recommendations concerning these issues were made to Burlington Northern Railroad Company, National Railroad Passenger Corporation, American Short Line Railroad Association, Association of American Railroads, and the railroads that have adopted the General Code of Operating Rules

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the track laborer to restore the stub track switch for the mainline track, the failure of the crane operator and track foreman to check the position of the stub track switch, and the failure of the operating management of Burlington Northern to restrict the speed of trains through a work area and to check the condition of the switch banner

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20594

RAILROAD ACCIDENT REPORT

COLLISION AND DERAILMENT OF AMTRAK TRAIN 6 ON THE BURLINGTON NORTHERN RAILROAD RUSSELL, IOWA OCTOBER 12, 1987

INVESTIGATION

The Accident

About 1130 central daylight time, on October 12, 1987, the Burlington Northern Railroad (BN) maintenance-of-way department took the eastward main track out of service between milepost (MP) 333 2 and Russell, Iowa, to replace curve worn continuous welded rail (CWR) A track bulletin was issued to protect men and equipment between MP 321 and MP 323 7, east of Russell, on both the eastward and westward main tracks The track bulletin was effective from 0630 to 1801 The engineering department was also preparing to replace the at-grade Main Street crossing at Russell and relocate a siding switch on the eastward main track using on-track equipment To protect men and equipment involved in this effort, a second track bulletin was issued, effective from 0801 to 1300 between MP 325 and MP 327 8 on both the eastward and westward main tracks

That morning, National Railroad Passenger Corporation (Amtrak) train 6, the California Zephyr, was operating eastbound The train was being operated over BN tracks as Extra Amtrak 396 East The train consisted of two diesel-electric passenger locomotives, three baggage cars, a coach/dorm car, five coaches, a lounge/cafe car, a dining car, and three sleeping cars An Amtrak operating crew change was made at Lincoln, Nebraska, at 0610 Train 6 entered the First Subdivision of the Galesburg Division at Creston, Iowa, a crew-change point for BN crews An exchange of BN pilots[1] was made at that time (See figure 1)

The new BN pilot had a track warrant and three track bulletins, which he showed to the Amtrak engineer and fireman as they departed Creston at 1018 (See appendix C) The dispatcher radioed the crew of train 6 after they stopped in Osceola, Iowa, and furnished two additional track warrants (See appendix D) One track warrant gave train 6 the authority to cross over at Chariton, Iowa, and proceed eastbound on the westward track through Russell to Halpin, Iowa, and the other track warrant gave train 6 the authority to proceed eastbound on the eastward track "CTC Maxon to MP 168 4 "[2]

Train 6 proceeded on the eastward track from Osceola to Chariton without incident Upon arrival at Chariton at 1115, an operator who was assigned to assist trains in crossing over from the eastward to the westward track contacted train 6 and made arrangements by radio to cross train 6 over to the westward main track To make the crossover, train 6 proceeded east of a trailing point

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[1]A qualified employee assigned to a train or other on-track equipment when the engineer is not qualified on the physical characteristics or rules of the portion of the railroad over which movement is to be made A pilot is not required to and does not normally operate the locomotive

[2]The location where the signal system changes from centralized traffic control to an automatic block signal system

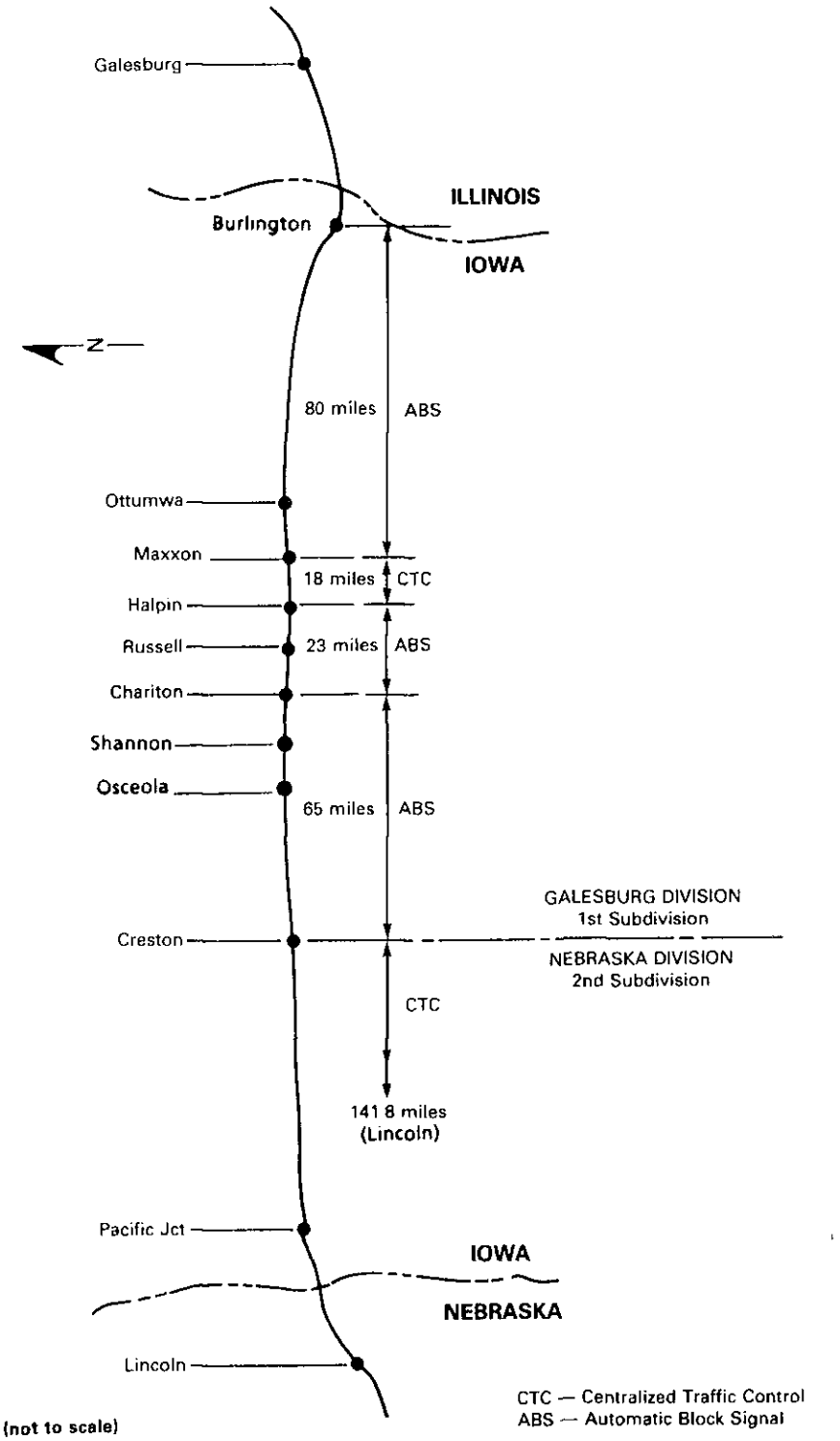

Figure 1 --Route of Amtrak train 6 from Lincoln, Nebraska, to Galesburg, Illinois

crossover[3] and backed west through the crossover onto the westward track The operator handled all the switches involved in this movement This crossover is located at MP 334 7 at Chariton

At 1122, train 6 left Chariton, operating eastbound on the westward track against the current of traffic Although this portion of track was equipped with an automatic block signal (ABS) system, no signal aspects were displayed for movement against the current of traffic

The maintenance-of-way track foreman responsible for the track work at Russell stated that about " 11 05, 11 10, I told [the laborer] to go with [the crane operator] and put the machine on the westward stub in the clear for Amtrak [because] we had Amtrak coming "

After leaving Chariton and about 5 miles from Russell, the pilot initiated radio communications with the track foreman on the track bulletin for the first work area The pilot requested and received authority from the track foreman to pass the red stop board[4] and proceed through the work area at normal speed (See figure 2) The engineer, fireman, and pilot stated that they proceeded at the normal speed of 59 mph authorized by the BN timetable special instructions [5]

The pilot and engineer observed the yellow board and red board as they continued eastbound toward Russell As they came into Russell, they simultaneously observed that the switch points of the stub track switch were aligned for the stub track instead of for the main track They also observed that a crane with a flat car was on the stub track The crew estimated that they were about 1,000 to 1,500 feet west of the switch when they saw the equipment (See figure 3) They could not remember seeing the switch banner position on the switch stand mast The engineer said he immediately initiated an emergency application of the train brakes and shouted to the fireman and pilot to get on the floor The engineer, fireman, and pilot then braced themselves for the collision About 1130, train 6 struck the maintenance-of-way work equipment on the west stub track at Russell (See figure 4)

The traincrew stated that they believed the locomotive negotiated the turnout without derailing before the collision During the collision, they heard an explosion and saw flames surround the locomotive cab Following the collision, the locomotive came to rest on its left side (fireman's side) The crewmembers knocked out the front window on the fireman's side of the cab with a fire extinguisher and exited the cab compartment

The track foreman said that he heard a loud noise shortly after he gave train 6 authority to proceed by the red board into the work area at normal speed At the time, he was at the Main Street grade crossing about 1 mile east of the switch to the west stub track Soon after that, he heard somebody on his radio " I was assuming it was a conductor on the Amtrak, saying Amtrak, emergency, emergency, Amtrak " The track foreman, crane operator, and track laborer drove back to the west stub track, where they saw that train 6 had entered into the stub track and collided with the track crane The track foreman and the track laborer noted after the accident that the track switch was in the reverse position, leading into the stub track A passenger car was on the switch rails and the switch lock was applied and locked on the switch stand (See figures 5 and 6)

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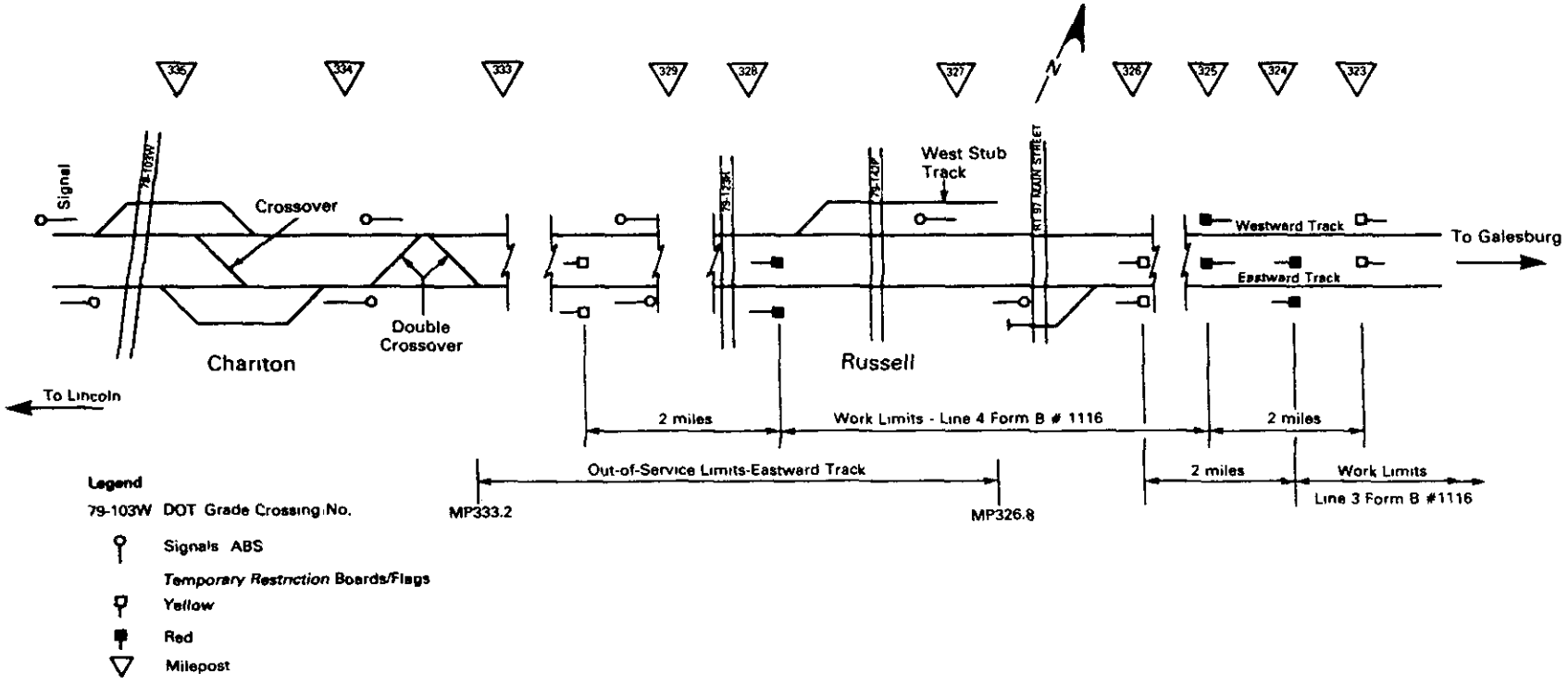
[3]A trailing point crossover has switch point rails that face away from traffic approaching the direction for which the direction of traffic has been designated

[4]A red stop board is used to mark the limits of the work area where trains must stop, unless authorized to proceed The stop board may be a flag of cloth, metal, or other suitable material

[5]Special instructions in the BN timetable and Federal regulations (49 CFR Part 236) restrict the speed of passenger trains to 59 mph when moving against the normal current of traffic on track signalled in one direction only



(not to scale)

Source: Burlington Northern

Figure 2.-- Chariton to Russell track conditions - October 12, 1987

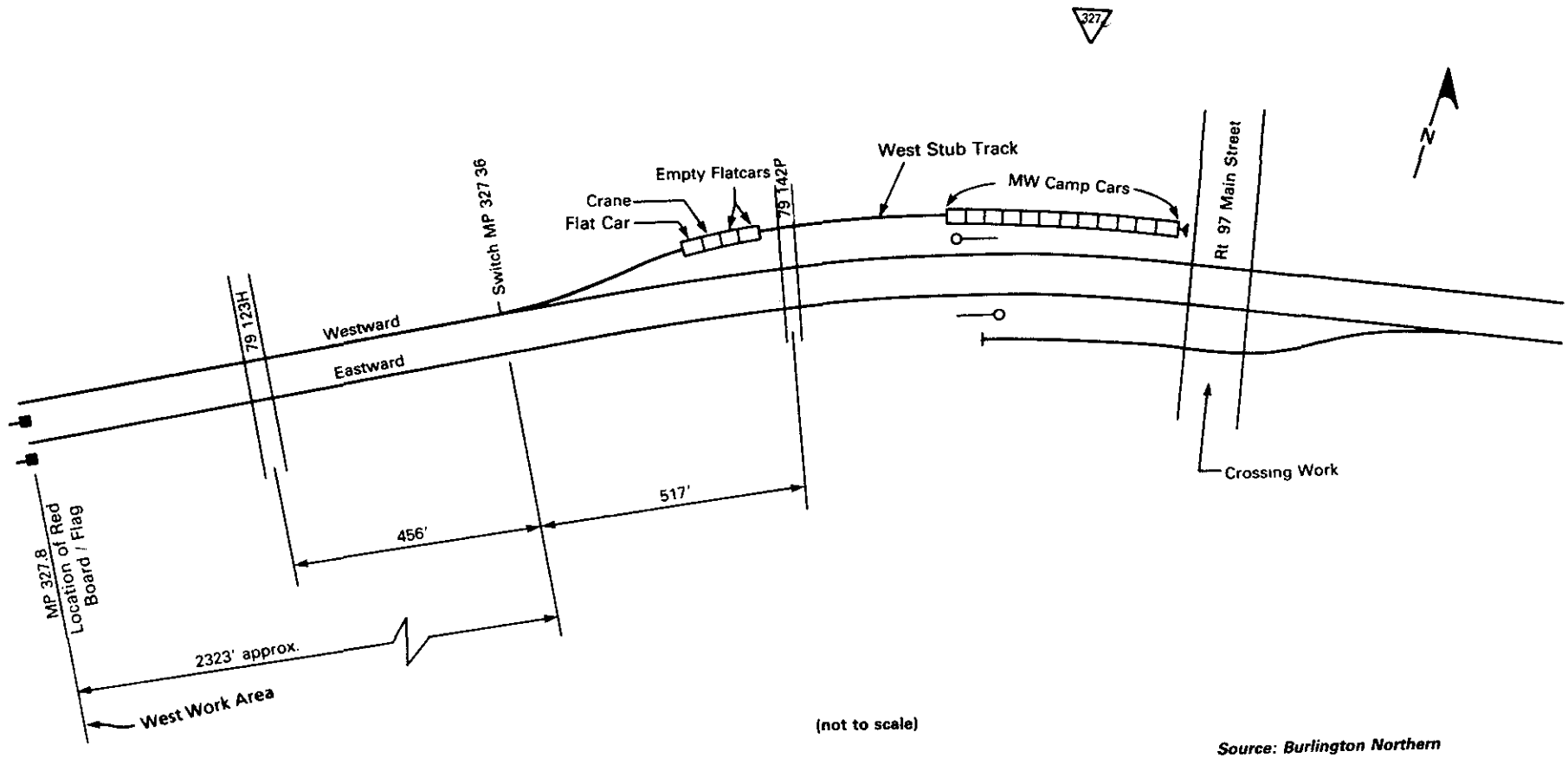


Figure 3.--Russell west stub track - October 12, 1987

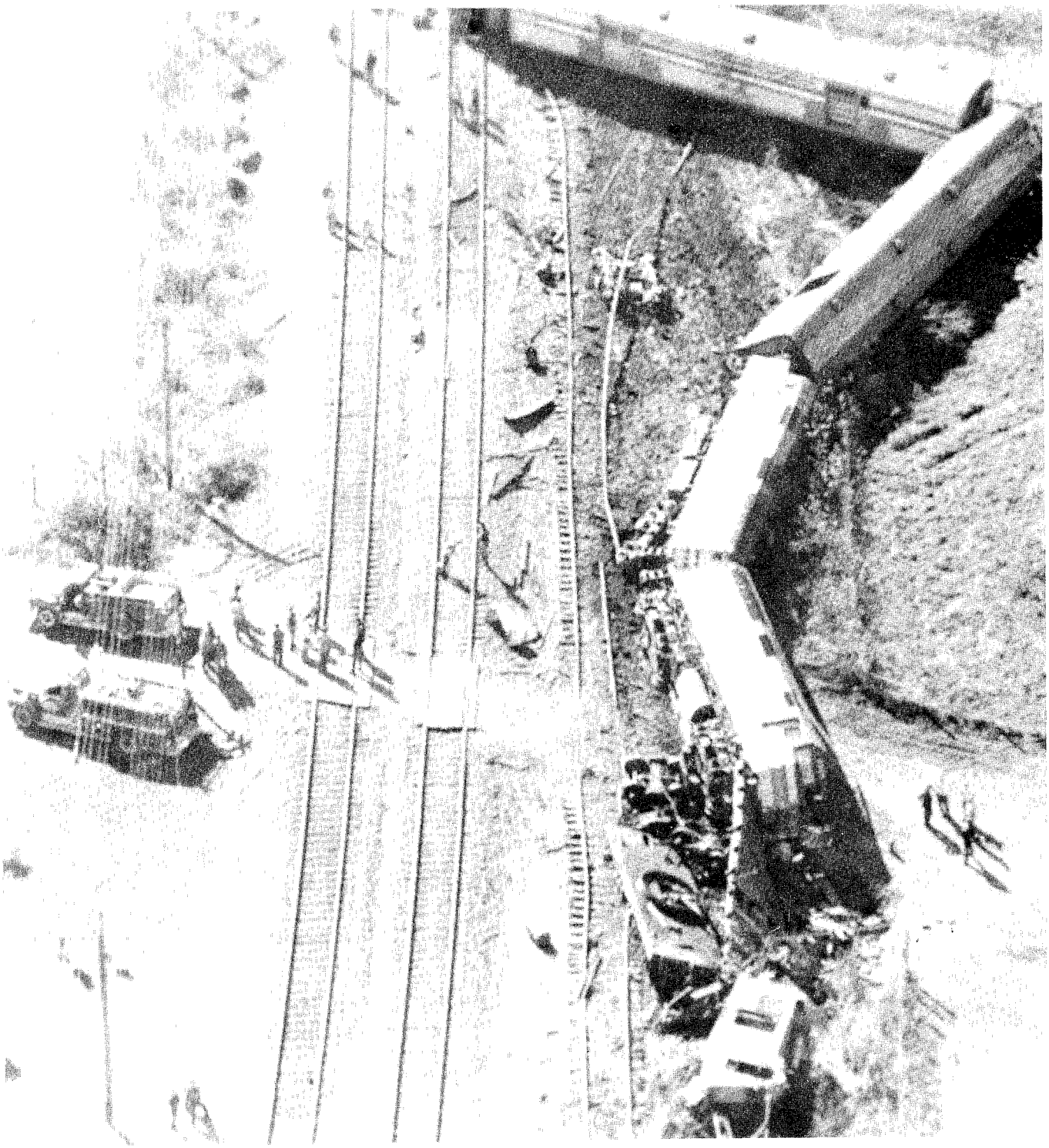


Figure 4 -- Aerial view of accident site

Figure 5 --AMT 34076 on turnout switch point rails
(north side view)

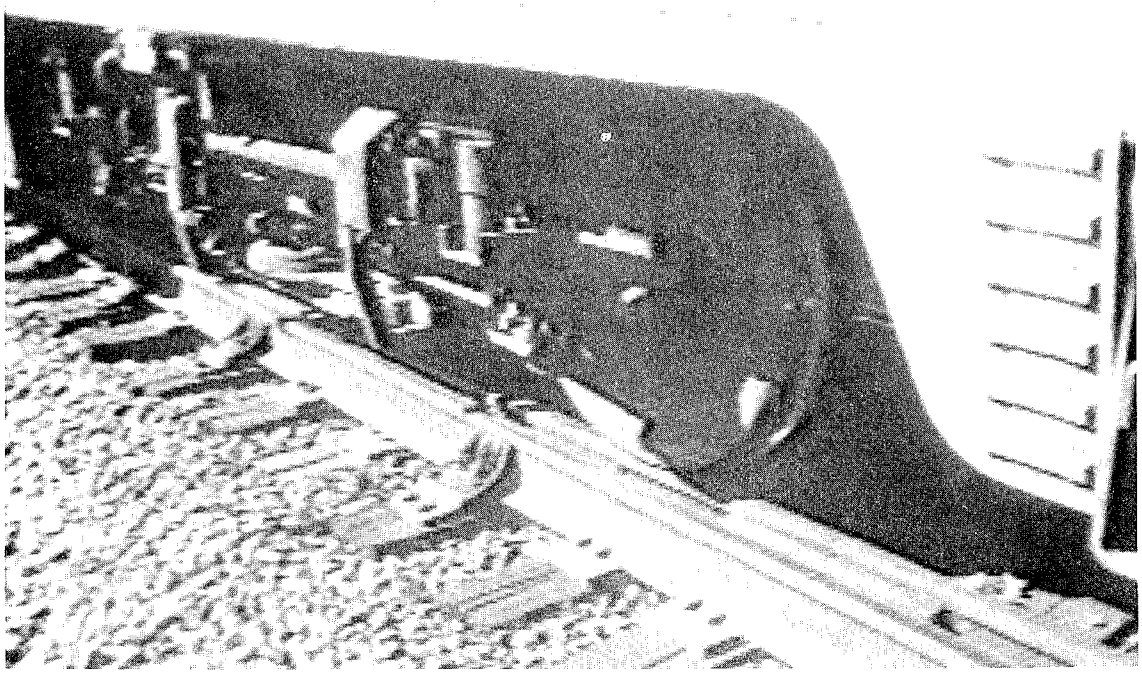


Figure 6.--AMT 34076 on turnout switch point rails
(south side view).

Injuries to Persons

Injuries	Passengers	Crewmembers	Total
Fatal	0	0	0
Nonfatal	107	15**	122***
None	123*	9	132
Total	230	24	254

* Estimated number provided by Amtrak
** Includes the BN pilot
*** 5 crewmembers and 8 passengers were hospitalized

Damage

The two locomotive units of train 6 received extensive damage Unit 396, the lead unit, was facing forward, in the direction of travel, and unit 357, the trailing unit, was facing rear Both units turned on their sides (See figure 7) The nose and electrical connections of unit 396 were damaged on the pilot end, while the airbrake system and sheet metal were damaged on the left (fireman) side The sheet metal of unit 357 was damaged on the right (engineer) side, as were the fuel tank and trucks The sheet metal of the sides and ends of the baggage and passenger cars were damaged, and the derailed trucks and wheel sets were damaged

The BN reported that its three flat cars were destroyed In addition, the crane was extensively damaged The cab compartment of the crane was separated from its supporting car underframe and the boom separated from the cab and buckled (See figure 8)

The two flat cars east of the crane were derailed and tipped to the north side of the stub track The crane's boom (facing east) was displaced east of the supporting car underframe, and to the north of the stub track The flat car that had been west of the crane was separated from its trucks and was partly on top of the crane's supporting car underframe to the north of the stub track The west end sill of the west flat car was compressed between the anti-climbers and the front coupler of locomotive unit 396, which was on its left side north of the stub track

Total estimated damage to equipment and track was as follows

Equipment	$3,146,023
Track	46,000
Total	$3,192,023

The BN provided the following damage assessment for its equipment

Equipment	Damage
BN 959555	$ *
BN 975426	128,000
SP&S 36005[6]	*
SP&S 36003	*
Total	$128,000

*Flat cars sold as scrap for $250 each

[6]SP&S 36005 and 36003 are the reporting identification marks for the former Spokane, Portland and Seattle Railway, now part of the BN

Figure 7 --Locomotive of train 6 after the collision

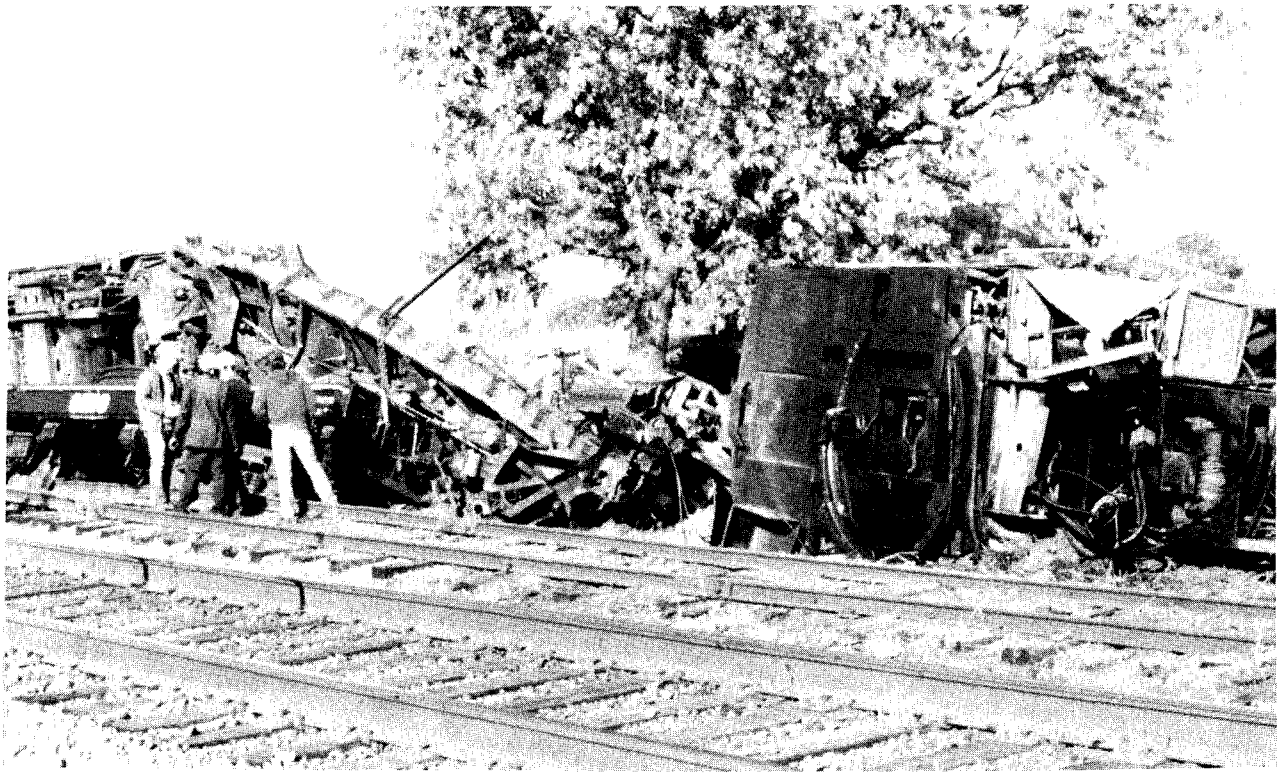


Figure 8 --Locomotive, flat car, and crane after the collision.

Amtrak provided the following damage assessment for its equipment

Equipment	Damage
AMT 396 F-40-PH	$ 350,000
AMT 357 F-40-PH	300,000
AMT 1155 baggage	848,827*
AMT 1271 baggage	659,235*
AMT 1169 baggage	148,257
AMT 39901 coach/dorm	98,321**
AMT 32048 sleeping car	65,504**
AMT 39957 coach	85,485**
AMT 34076 coach	76,010**
AMT 34065 coach	119,002**
AMT 33004 lounge/cafe	106,915**
AMT 38023 dining car	69,918**
AMT 34014 coach	51,011**
AMT 32054 sleeping car	37,538**
AMT 34027 coach	1,000**
AMT 32063 sleeping car	1,000**
Total	$3,018,023

* estimated replacement cost, car was scrapped
**actual cost

Personnel Information

The operating crew of train 6 consisted of an engineer, a fireman, a conductor, and two assistant conductors, all employed by Amtrak, and a BN pilot The Amtrak crew went on duty at Lincoln at 0610 on October 12, 1987 The conductor and assistant conductors had been employed by Amtrak since March 1987 However, all five Amtrak crewmembers had been previously employed by other carriers and had prior passenger train experience with Amtrak while employed by the other carriers (See appendix B)

The engineer had been employed by the Illinois Central Gulf (ICG) railroad since August 1961 and had 14 years of passenger train experience His service with Amtrak began in May 1987, and he had made six round trips between Lincoln and Galesburg, Illinois, during this period This was not his regular assignment, he was assigned these trips while working as an extra (substitute) engineer Before the trip on train 6, the engineer had been off duty for approximately 29 hours at Lincoln

The engineer had passed the required physical examination and operating rules examination, but had not been qualified on the characteristics of the Nebraska and Galesburg Subdivisions He was therefore required by the BN to have a BN pilot He stated that, "Each engineer when he feels comfortable with running over the territories [Amtrak supervision] will contact the BN they will assign a road foreman to say whether we are qualified or not "

The pilot had been employed by the BN since 1943 He entered engine service in 1951 and was promoted to engineer in 1958 The BN pilot's record of physical examination reflected that his vision, corrected with glasses, was within normal limits, as was his hearing

The BN pilot went off duty at 2000 on October 11, 1987, and reported for duty on train 6 at 0940 on October 12, 1987 The BN pilot came on duty at Creston, a crew change point for BN crews

The fireman had been employed by the ICG in 1975 as a brakeman He served as a brakeman and fireman and was promoted in 1978 to engineer He became an Amtrak employee in June 1987 and was making his first regular assigned trip as a fireman on train 6 He stated that he had made one other trip as an extra fireman in September 1987 Up until the time of his assignment as fireman of train 6, he had been assigned to the fireman's extra board between Chicago, Illinois, and St Louis, Missouri Before the trip on train 6, the fireman had been off duty for approximately 29 hours at Lincoln

The crane operator was employed by the BN in 1977 and had been a work equipment operator since 1978 in the Chicago Region BN records show he had taken the rules examination on February 27, 1986, and that no medical problems were reported on his physical examination of November 19, 1986 On October 9, 1987, he was working in Knoxville, Iowa, and was instructed to prepare his equipment for travel to Chariton, where he was to report to the roadmaster at 0700 on October 12, 1987, for his assignment He stated that he was well rested when he reported for work that morning and the only medication he had taken was an aspirin at lunch that afternoon His personnel record shows no entries for training other than acknowledgements that he had received the Safety Rule Book and had taken maintenance-of-way rules examinations

The track laborer was employed by the BN in 1973 BN records show he had taken the rules examination on March 14, 1986, no medical problems were recorded on his company physical of November 7, 1986 A record of the track laborer's activities before reporting to work at Chariton at 0700 on October 12, 1987, could not be established during the Safety Board's deposition proceedings (See appendix A) On the advice of his attorney, he would not answer questions concerning his activities during the 3 days before the accident His personnel record shows no entries for training other than acknowledgements that he had received the Safety Rule Book and that he had taken maintenance-of-way rules examinations

The track foreman started his employment with BN in 1974 He resigned January 10, 1975, and was reemployed on May 5, 1975 He had worked various positions before becoming a section foreman on June 9, 1977 BN records show he had taken the rules examination on March 14, 1986, and that no medical problems were recorded on his company physical on April 12, 1985 The track foreman stated that he worked late on October 9, 1987, leaving his headquarters in Chariton after 1800 His weekend was spent at home He stated he went to bed early on October 11, 1987, and " got up approximately 5 o'clock Monday morning " He stated that he was not taking any prescribed medication and that he considered his health good and his vision to be 20/20 He reported to his headquarters at Chariton at 0700 on October 12, 1987 His personnel record shows entries for first-aid training, safety meetings, and a maintenance-of-way foreman's class, in addition to acknowledgements for receipt of the Safety Rule Book and maintenance-of-way rules examinations

Train Information

Amtrak train 6 operates daily from Oakland, California, to Chicago On the day of the accident, the train consisted of a locomotive with 2 units and 14 passenger cars The cars were in the following order 3 baggage cars, 1 superliner coach/dorm, 1 superliner sleeping car, 3 superliner coaches, 1 superliner lounge/cafe, 1 superliner dining car, 1 superliner coach, 1 superliner sleeping car, 1 superliner coach, and 1 superliner sleeping car

The locomotive consisted of two 3,000-hp, diesel-electric passenger units, type F-40-PH, manufactured by the Electro-Motive Division (EMD) of the General Motors Corporation Each locomotive unit was equipped with 26L brake equipment, a Train Sentry II Alerter manufactured by Pulse Electronics, Inc , and an overspeed limit control with a warning whistle Lead unit 396 was equipped with an Aeroquip (Barco) event recorder for elapsed time and speed Trailing unit 357 was equipped with a Pulse Electronics, Inc , event recorder system that recorded elapsed time, distance,

speed, traction motor current, throttle position, and automatic brake application The locomotive units were also equipped with speed indicators and twin sealed-beam headlights Each locomotive unit had collision posts designed integrally with the low front hood welded to the underframe and had a protective horizontal bar attached to the front cab wall over the fireman's controls The locomotive's doors were opposite each other, one on each side of the cab behind the engineer's and fireman's positions

Postaccident inspection of the cab controls of unit 396 found the control stand reverser in the forward position, throttle in idle position, brake control off, headlight switch on bright, and operating switches on The airbrake handles were found in the following positions automatic brake valve in emergency position, brake pipe cutoff in pass position, independent brake valve in release position, and fireman's emergency valve not applied, with the pipe flange broken and pipe open to the atmosphere

The radio in unit 396 was an ALPHA Clean Cab series, number APC9RB60CCR45, furnished by Aerotron, Inc The handset's cannon-type connector was broken loose from its mounting, but the connection was intact

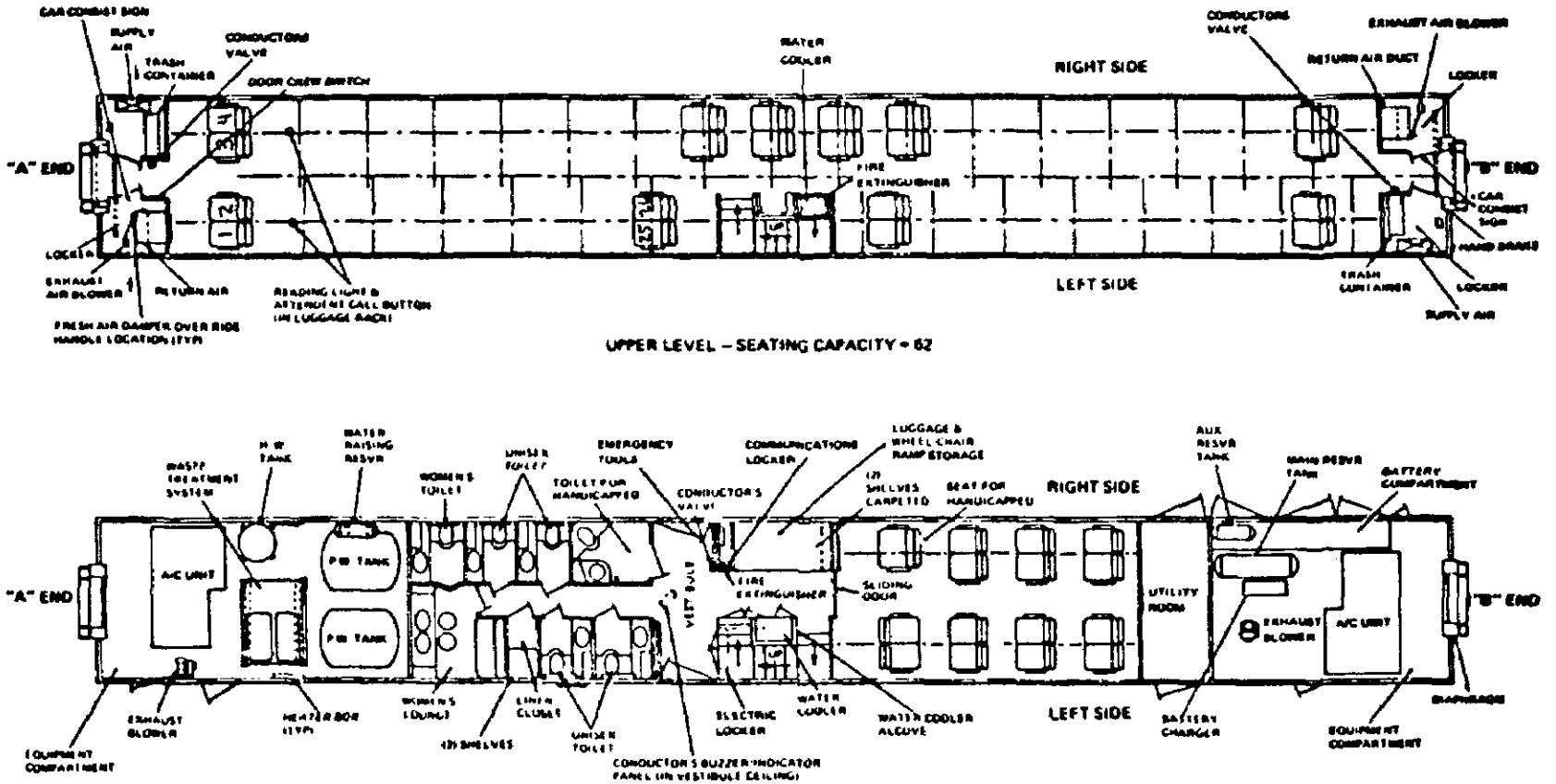
The three baggage cars were about 80 feet long with two doors on each side to load and unload baggage or mail These cars were also equipped with a door on each end for employees to enter and exit the car The head-end baggage car was being used as a mail car

The coach/dorm car was a former Atchison, Topeka, and Santa Fe high-level coach It was about 85 feet long and constructed of stainless steel The car had an upper level with 64 coach seats--16 rows with 2 seats on each side of the center passageway Stairways to the lower level were located near the middle of the car On the lower level were two lavatories and a crew room, each end of the car was used for equipment This car was used as a dorm car for the traincrew and for the onboard Amtrak service personnel

The five coach cars were of the superliner type Each car was about 85 feet long and constructed of stainless steel The upper level had 62 coach seats with leg rests, the lower level had 15 coach seats A stairway connecting the two levels was located near the center of the car On each side of the car on the lower level was a center entrance door, on the upper level were end doors that permitted access to the other cars (See figure 9)

All seats in the five coach cars were double-width seats with one armrest on each end of the pair of seats Each of these double-width seat units was mounted on a central pedestal The units locked into position when facing either forward or rearward They could be unlocked and allowed to rotate to the alternate position by depressing a pedal at the base of the pedestal The seats then snapped into the locked position Seatback cushions were designed to be removed by first pulling the bottom of the cushion away from the frame, separating the hook-and-loop type fastener, then lifting the headrest part of the cushion off the sheet metal strip at the top of the frame, which served as the headrest support Overhead luggage racks, approximately 2 feet wide, were located along the sidewalls over the seating areas and contained no type of baggage securing devices

The lounge/cafe car was of the same construction and design as the superliner coach This car had 50 seats, both swivel and fixed, on the upper level with a bar and lounge in the center of the car next to the stairs The lower level had 23 fixed booth-type seats at the center, and equipment storage at the ends of the car The dining car was of the same construction and design as the superliner coach It had 72 booth-type seats on the upper level and the galley on the lower level



Source: Amtrak

Figure 9 --Coach car, interior arrangement and floor plan.

The three sleeping cars were of the same construction and design as the superliner coach Each had five deluxe rooms and 10 economy rooms on the upper level, for a sleeping capacity of 30 A stairway led to the lower level, where there were four economy rooms, one family room, and a handicapped room, for a sleeping capacity of 14 The lower level had five unisex restrooms and storage at the car ends (See figure 10)

The maintenance-of-way work equipment consisted of three wood-deck flat cars and a self-propelled, diesel-electric crane The BN 959555 flat car, built in 1936, and the SP&S 36005 and 36003 flat cars, built in 1952, were assigned as maintenance-of-way work equipment The diesel-electric crane, BN 975426, was an Ohio Locomotive Crane of 40/50 ton capacity with a two-section, 50-foot-long boom The rotating cab compartment was mounted on a supporting car underframe with truck-mounted traction motors on two-axle trucks The cab compartment contained the engine plant and a separate elevated operating compartment at the right front corner For travel in a train, the boom was secured to a steel support arrangement, attached to a flat car that also served as an anchor post for compressed gas cylinders used by maintenance forces A punctured, burnt, and capped compressed gas cylinder measuring about 18 inches in diameter and 48 inches long was found near the point of collision

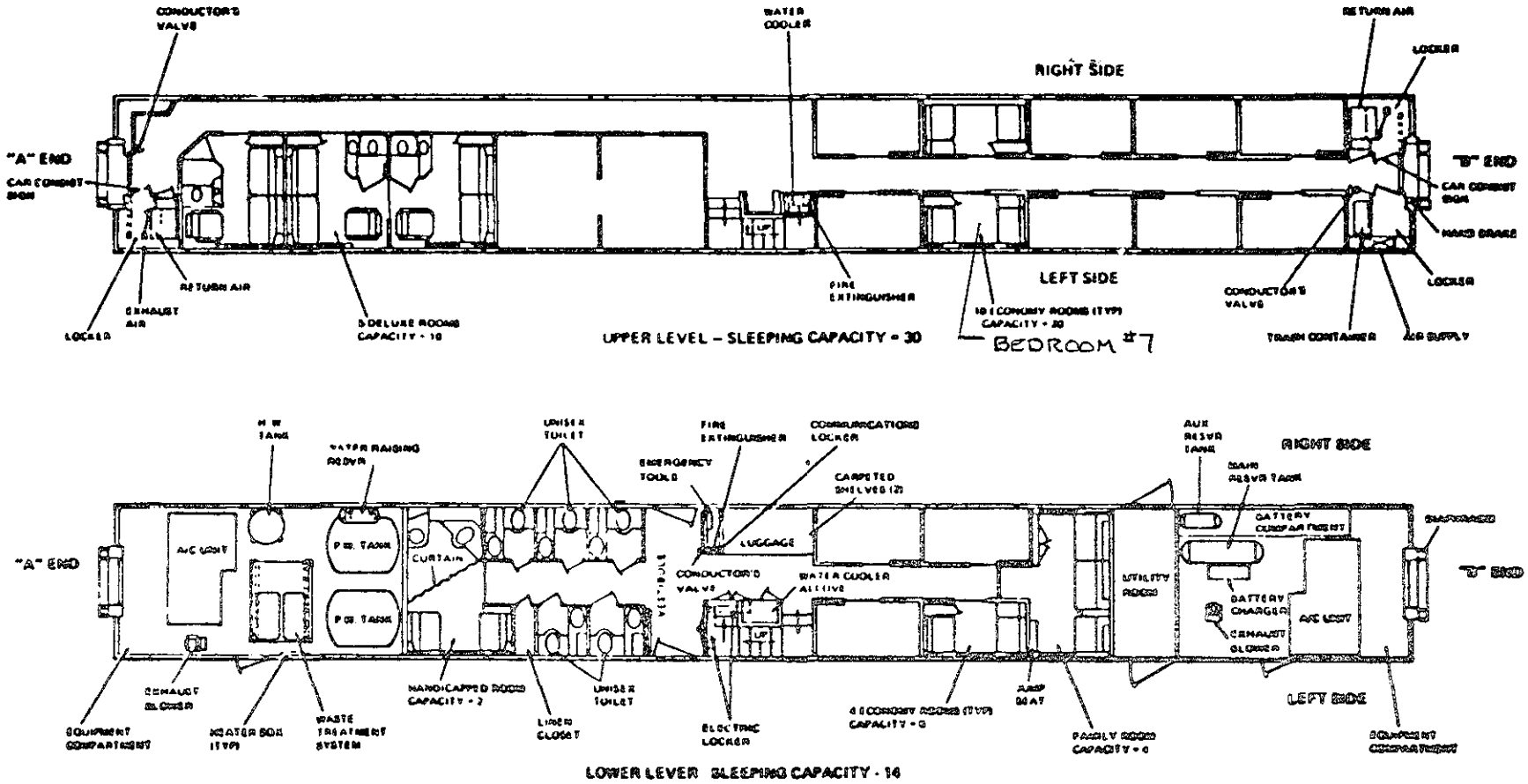
Track and Signal Information

Between Creston (MP 392 9) and Halpin (MP 307 5) the BN double main track is equipped with an ABS system, using color light signals The tracks are signaled in the designated direction of traffic only Russell (MP 326 8) is between Chariton and Halpin The main track east of Halpin is equipped with centralized traffic control (CTC) signaled for traffic in both directions The double main track west of Chariton (MP 334 3) to Shannon (MP 342 0) had been signaled for CTC in both directions However, on October 29, 1986, with the issuance of a General Order to modify the signal system, this area became an ABS system signaled in the designated direction of traffic only

The west stub track at Russell was accessible only from the hand-thrown track switch on the westward track at about MP 327 36 The track switch was connected to the ABS system by a General Railway Signal Co mechanical switch circuit controller The track switch was configured to be a trailing point switch for the normal (westward) direction of traffic

The trailing point crossover, at about MP 334 6 at Chariton, was being used for eastbound trains to cross over to the westward track on October 12, 1987 Facing and trailing point crossovers (double crossovers) are located at MP 333 2 east of Chariton The double crossover at MP 333 2 is the last location that trains can be crossed over from the eastward main track to the westward main track before Russell In a response to a request for documentation for the limits of out-of-service track in the Russell area on the day of the accident, the BN provided information to the Safety Board that read, "Eastward track out of service MP 333 2 to Russell acct (sic) steel gang " This information indicated that the eastward track, west of the work area specified in the Form B order, was out-of-service between the double crossover at MP 333 2 and Russell (MP 326 8) This area did not include the double crossover at MP 333 2 (See figure 2)

The roadmaster, in charge of track maintenance for this area, stated that the chief dispatcher's office contacted him several days before the accident about using the crossover at MP 333 2 for a facing point move He stated that the crossover was out-of-service at the time, but, since the chief dispatcher's office needed it for operation, he said, "Yes, we can do it " The roadmaster stated that before October 12, 1987, the crossover was returned to service and the chief dispatcher was aware of the return to service After the accident, the roadmaster told Safety Board investigators that a temporary operator was at the double crossover at MP 333 2 when train 6 crossed over to the westward track



Source: Amtrak

Figure 10.--Sleeping car, interior arrangement and floor plan.

From the track switch located at about MP 327 36, the west stub track extends eastward for about 3/4 mile on the north side of the double main track. The track switch was part of a No. 11 turnout.[7] The switch points, 19 feet 6 inches in length, were mated to undercut stock rails. The switch stand was a Racor column-throw high stand, without a switch-point locking mechanism. It was equipped with a partially rusted, red-painted banner measuring 8 inches by 36 inches and located approximately 5 feet above the top of the rail. (See figure 11.)

The switch stand lever was secured with a Sargent & Greenleaf Model 105 security lock. The lock had a retaining chain, which was not attached to the switch stand. Switch keys, according to BN management, were assigned only to those employees who needed them to do their jobs The keys had serial numbers, and were assigned to and signed for by the employees. After the accident, the BN had accounted for all of the switch keys distributed to employees. The lock functioned normally after the accident and showed no apparent signs of damage The track foreman stated that following the accident, ". . .I looked to see if the lock was on the switch, and it was. And I grabbed the lock and jerked it to see if it was locked, and it was. . ."

The portion of the westward main track structure not damaged in the accident met or exceeded the minimum requirements for class 4 track as defined in the Federal Railroad Administration's (FRA) Track Safety Standards in 49 CFR Part 213.

Figure 11.--West stub track switch banner.

[7]The turnout number corresponds to the frog number used in the turnout It is the number of units of center line length in which the spread is one unit

Maintenance-of-Way Information

Operations --The at-grade highway crossing for Iowa State Route 97, located about MP 326 9, was a three-track paved crossing with wood guard timbers The crossing was to be renewed as part of a capital-improvement project into a two-track rubberized at-grade highway crossing The work involved relocating a track switch, south of the eastward main track, from the east side to the west side of the grade crossing, to reduce the number of tracks through the crossing The two tracks through the crossing were to be replaced with track panels built on site with rails long enough to eliminate rail joints in the crossing

The roadmaster in charge of the Russell area made arrangements on October 9, 1987, to provide protection for the movements of trains and maintenance-of-way equipment through the Russell area The track foreman normally made these arrangements, but his work had detained him at another location and the roadmaster offered to make the request for the required protection According to the roadmaster and the track foreman, this protection was a Form B track bulletin, as provided in rule 455 of the BN Rules of the Maintenance of Way, Form 15125, effective April 27, 1986 (See appendix E) Form B No 1116 was issued through the dispatcher on October 12, 1987, for westbound trains at Galesburg, for trains originating at Burlington, Ottumwa, and Albia, Iowa, and for eastbound trains at Creston Line 4 of Form B No 1116 assigned the control of both tracks between MP 325 and MP 327 8 from 0801 to 1300 to the track foreman at Russell (See appendix C)

In addition, Form B No 1116 addressed the work of a rail-laying gang operating between MP 321 and 323 7 from 0630 to 1801 Line 3 of Form B No 1116 gave another track foreman control of both tracks through that area while BN employees replaced curve worn rail on the eastward track east of Russell

The track foreman involved in this accident stated that when he reported for work at 0700 on October 12, 1987, at Chariton, the roadmaster, " handed me the Form B slip with the limits on it " He received instructions from the roadmaster for the work at Russell and requested a line-up (list of trains for that area) from the operator The roadmaster told him to load four 78-foot rails onto flat cars using the crane, proceed to Russell, and build track panels for the grade crossing reconstruction The track foreman assigned a laborer to assist in handling the crane through the switches and to act as a pilot when the crane and three flat cars moved to Russell The track foreman stated that the laborer was qualified to act as a pilot because " He's had a Book of Rules and he's got switch keys " The track foreman discussed the work activities for the day, but could not recall whether he had given any instructions to the laborer

The track foreman could not recall having radio communications with any traincrews while his crew was loading material at Chariton The only train he could recall was " the westbound freight that went by early that morning " Later during his deposition, he stated that he authorized " the first westbound train that went by, I hadn't had the boards up yet and I cleared him through with those instructions " An excerpt from the BN dispatcher's tape for October 12, 1987, from 0845 to 0908 shows that the track foreman was contacted by BN Extra 7200 East The track foreman answered, " OK to proceed through Form B 1116 line number 4 at normal speed No track flags displayed " This train was traveling eastbound toward Russell on the westward track having crossed over at Chariton

After the freight train left Chariton, the crane and flat cars being used in the maintenance-of-way work crossed over the main tracks to the south yard and the rails were loaded They then returned to the westward track to proceed eastbound to Russell The two flat cars loaded with the rail were on the east end of the crane and one empty flat car was on the west end The track foreman told the crane operator to proceed with the crane while he " followed along the road which runs parallel to the tracks " BN operating rules do not require acknowledgement or

discussion with a dispatcher for movement of maintenance-of-way equipment by line-up in ABS territory

The track foreman told Safety Board investigators that while driving east, he talked to the crane operator by radio to determine the milepost locations that would define the Form B limits so that he could set out the red and yellow boards However, the crane operator stated that he had no conversation with the track foreman The track foreman stated that he " set the yellow boards two miles in advance of our work order ," went into Russell, met the crane operator, and " started unloading rail, and that's when he started setting the red boards And I drove and set the east end boards " No green flags were placed because the track foreman stated that he " was verbally authorizing all the trains by radio "

After the rails were unloaded, the track foreman instructed the crane operator and the laborer to place the two empty flat cars at the east end of the crane just west of Russell into the west stub track north of the westward main track The laborer rode the footboard of the crane to the stub track switch, unlocked the security lock, and lined the switch to the stub track He stated, " I believe I locked the switch before I walked back to the cars normal lined for normal position of the main line " He stated that the two cars were left 10 to 15 feet west of the grade crossing He then returned to the switch, unlocked the security lock, realigned the switch to the stub track, and gave the crane operator " the go-ahead by hand signal " The track laborer stated he locked and lined the switch for the main track and climbed on the footboard after the crane was clear of the switch They proceeded eastbound on the westward track with only one flat car A flat car, with compressed gas cylinders anchored to the boom support, remained on the west end of the crane The crane operator and the laborer returned to the grade crossing at Russell, where the men began assembling the track panels

The maintenance-of-way department kept three water tank cars, two tool cars, a cook car, a dining car, and seven camp cars at the east end of the west stub track for the maintenance-of-way personnel working east of Russell The west end of that equipment was about 1,800 feet east of the track switch to the west stub track However, during a later deposition conducted by the Safety Board, the roadmaster stated, " the main line switch was spiked[8] prior to the time we took the bridge derrick over there that morning The track had been taken out of service " During the on-site investigation, the roadmaster told Safety Board investigators, " The switch was not spiked " Following the deposition, the BN provided a letter stating

> There were no written orders protecting the equipment that was parked in the spur track [west stub track] at Russell, Iowa The switch was spiked and could only be opened by a maintenance-of-way employee

The track foreman said he had instructed the crane operator and laborer to clear the crane in the west stub track for train 6 about " 11 05, 11 10, somewhere in there and I told [the laborer] to go with [the crane operator] and put the machine on the westward stub in the clear [because] we had Amtrak coming " He had received

> two or three updates that morning, I believe one from the dispatcher, and twice I called the operator at Chariton, and he went through the dispatcher and got a time--one time when [train 6] left Creston and another time was an exact location on [train 6]

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[8]An accepted maintenance-of-way practice is to insert a track spike in the switch plate against the closed switch rail to indicate to all railroad employees that the switch is out of service This spike can only be removed by maintenance-of-way employees in the course of their work

When the crane operator and laborer started to move westbound to clear the crane, the track foreman told them he would meet them at the crossing near the west stub track and then bring them back to the Main Street crossing

The laborer mounted the footboard on the west end of the flat car and rode with the crane to the switch The laborer testified

> After we proceeded west, I run him past the switch That was after I got off the footboard I walked back to the switch, unlocked the switch and lined it for the side track I give [the crane operator] a hand signal for him to proceed in east on the stub track I waited for him to get past the clearance point and in order to tell that, on both rails you have insulated joints, and they are painted orange After I saw that he was in the clear, I locked, or realigned, the switch for the main line track and relocked the switch

Safety Board investigators asked the laborer whether he used the switch banner or position of the switch point to assure himself that the switch was lined for the main track, he stated, "I never used any indication when you work a job for 14 and 1/2 years, it's the same as habit or instinct " The laborer walked east to the grade crossing with the crane operator When asked how the switch became locked and lined for the diverging route into the stub track, the laborer stated, "The only answer I can give you on that question is, is that in my own human error, that I just did not throw the switch correctly and I lined and locked it for the stub track "

The crane operator stated that when he proceeded into the stub track, he determined he was past the clearance point by looking in his outside rear-view mirror He stated that the clearance point was designated by orange painted crosstie ends He also stated that while he secured the crane by setting the crane's brake in emergency and using the hand brake, the laborer stayed at the switch The crane operator stated that he did not look at the switch, stating "That's not my job My job is to operate the crane "

When the track foreman arrived to pick up the crane operator and laborer, he had to back his truck north across the grade crossing with his truck facing south The track foreman stated he stopped " on the stub track, westward stub track, or off of it I'm not sure if I was off it or on it " The crane operator and the track laborer were already walking toward the crossing, and the track foreman stated that he had to look over his right shoulder to see them He also stated that he could not see the switch at that point because the " crane and cars were in the road " He stated that he did not think to look at the switch and that he did not have any conversation with the crane operator or laborer The three men then returned to the Main Street crossing The crane operator walked to a nearby cafe while the track foreman and laborer continued to build the track panels

The track foreman said he had been at the Main Street crossing for 5 or 10 minutes when he

> heard somebody hollering on the radio that's when Amtrak come on and said they was seeking instructions through my Form B I told them this was [the track foreman] in charge of Form B 1116, line 4, I told him it was okay to proceed through that Form B at normal speed by the red flag without stopping

In his deposition, the roadmaster stated that the track foreman said to him, " I guess this is my fault I didn't go up there and look at that switch "

Maintenance of Way Rules --On April 27, 1986, the BN adopted the Rules of the Maintenance-of-Way Form 15125 and the General Code of Operating Rules In preparation for the implementation of these rules, the BN conducted a rules examination for maintenance-of-way employees A 4-hour review of the rules followed by a written examination of the rules was given by a roadmaster with

the safety rules department or the assistant superintendent of maintenance present on some occasions The written examination was graded, the employees were then given an opportunity to discuss the rules missed and to look up the correct answers and correct the test The roadmaster stated that he had never disqualified an employee for failing the test

The track foreman and laborer were tested on March 14, 1986, and the crane operator on February 27, 1986, on these dates, 156 BN employees were tested BN officers testified that after employees took the written qualification rules examination, they were permitted to review it and correct their mistakes before the grade was recorded The test results for all employees show scores of 100 percent

Rule 455, for protection by track bulletin using a Form B, was introduced when the new rule changes were adopted BN management provided a statement to the Safety Board on January 21, 1988, that "There were no General Orders issued specifically concerning Form B Track Bulletins They went into effect along with the General Code of Operating Rules, and we had rules classes that covered not only Form B Track Bulletins, but all other changes in the rules before the General Code went into effect " Previously, in February 1987, the division manager of safety rules had come to the Galesburg Division, but he covered only Rule 40, "Clearing Train Time," with a speed, distance, and time chart

The track foreman stated that he chose option (b) of rule 455 for the maintenance-of-way work at Russell because " we hadn't disturbed the track bed at any point, and it was okay for normal speed There was no men and equipment on the track " (See appendix E) Rule 455 of the Rules of the Maintenance-of-Way states

> During the time and within the limits stated in track bulletin Form B, trains and engines must move at restricted speed and stop short of men or machines fouling track or a red flag placed to the right of the track unless verbally instructed otherwise as prescribed below or entire train has passed a green flag or has cleared the limits
>
> The engineer must attempt to contact employee in charge by radio sufficiently in advance to avoid delay, advising his location and specifying track In granting verbal authority, the following words will be used
>
> "Foreman_(name)_ (of Gang No __) using track bulletin No __ line no __ between MP_and MP_on _____Subdivision "
>
> (a) To authorize train or engine to pass a red flag, or enter limits, without stopping, the following will be added
>
> "_(train)_ may pass red flag located at MP_ (or enter limits) without stopping "
>
> Train or engine may pass red flag, or enter limits, without stopping, continuing to move at restricted speed and must stop short of men or equipment fouling track
>
> (b) To authorize a train or engine to proceed at a speed greater than restricted speed, the following will be added
>
> "_(train)_ may proceed through the limits at _(speed)_ mph (or at 'maximum authorized speed') "
>
> Train may proceed through the limits at the prescribed speed unless otherwise restricted

(c) To require train or engine to move at a speed less than restricted speed, the following will be added

"__(train)__ proceed at restricted speed but not exceeding____ MPH (adding if necessary 'until reaching MP_ ') "

Train must not exceed the prescribed speed and must be prepared to stop short of men or equipment fouling the track of a red flag to the right of the track

These instructions must be repeated by the engineer and "OK" received from the employe giving them before they are acted upon

When the word STOP is written in the Stop column, train or engine must not enter the limits until verbal authority is received from employe in charge as prescribed by example (a) above

Yellow flags must be displayed as prescribed by Rule 10

The Rules of the Maintenance of Way for the operation of main track switches states

75. Main Track Switches Main track hand throw switches must not be opened except for heavily loaded on-track equipment, and then only under the supervision of the employe in charge who will be held responsible for restoring switch to normal position

104 (A). Position of Switches. Employes handling switches and derails must see they are properly lined for route to be used It must be seen that points fit properly and that indication of target or lamp, if so equipped, corresponds with position of switch After locking a switch or derail, the lock must be tested to know it is secured

104 (B). Main Track Switches The normal position of a main track switch is for main track movement and it must be left lined and locked in that position except when changed for the immediate movement

On main track switches so equipped, the target will show red when lined in other than its normal position

To physically define the limits of a track bulletin Form B, the rules also require that flags of prescribed color be placed according to the required rules governing signals for an approaching train

In this regard, the Rules of the Maintenance of Way states in part (appendix E)

Fixed Signal A signal of fixed location indicating a condition affecting the movement of a train

9. Prescribed Signals Flags of prescribed color must be used by day, and reflectorized flags of prescribed color and type by night Flags may be cloth, metal or other suitable material

10. Temporary Restrictions A yellow flag will be displayed not less than 2 miles, when practicable, in advance of each location where train movement is to be

restricted by train order, track bulletin, track warrant or general order due to track conditions, structures, men or equipment Restrictions specified by train order, track bulletin, track warrant or general order must be complied with until rear of train has passed green flag or train has cleared limits of the restricion when green flag is not displayed

When yellow flag cannot be placed 2 miles in advance of restriction due to close proximity to a terminal, a junction or for other reasons, the train dispatcher must be informed of actual location of yellow flag Such information must be included in train order, track bulletin, track warrant or general order Employe requesting train order, track bulletin or track warrant must determine from train dispatcher if green flag will overlap yellow flag

10(A) Display of Red Flag A red flag will be displayed at locations where trains must stop as required by Form Y train order, track bulletin or other conditions

Train must stop short of the red flag and not proceed unless authorized by the foreman

If authority to proceed is received before stop is made, train may pass red flag without stopping

Both the engineer of train 6 and the BN pilot stated that they interpreted the red board used at Russell to be a fixed signal The BN division manager of safety rules stated, "No sir, it is not," when asked whether the red board was a fixed signal

The roadmaster stated that he had performed efficiency tests on the employees under his responsibility by observing them at work, which provided him an opportunity to evaluate their understanding and ability to apply these rules

From February 1987 to October 1987, two roadmasters tested the maintenance-of-way foremen on the Galesburg Subdivision The foremen were tested on 34 of the Rules of the Maintenance-of-Way as they applied to the activity they were performing Rule 455 was included in the efficiency testing 20 times, 15 of these tests took place during the use of on-track equipment, with one test having train traffic, 5 of the tests took place during the use of hy-rail[9] or off-track equipment, twice with train traffic and once as a hy-rail passed through the work area On 16 of the 20 tests, no trains or other equipment passed through the work area There were no tests for the track foremen's use of the radio as part of Rule 455 No failures were recorded on the efficiency test records

The efficiency test records during this period showed that the track foreman involved in the accident was operating a hy-rail and had been tested only three times by his roadmaster These tests indicated that he was evaluated three times for Rule 35 ("When Train Line-Up Required"), twice each for Rule B ("General Rules have rule book "), Rule 85 ("Flagging Equipment)," and Rule 538 ("Inspection of Trains"), and once each for Rule 43 ("Unable To Obtain Line-Up"), Rule 63 ("Road Crossings"), and Rule 455 ("Protection By Track Bulletin") (See appendix E)

The division superintendent testified that the maintenance-of-way laborer was responsible for this accident and was dismissed for violating three rules Rule 75 ("Main Track Switches"), Rule 104(A) ("Position of Switches"), and Rule 104(B) ("Main Track Switches") Concerning the safety of the system of checks and balances for the operation of trains over this main track and the failure of one individual causing an accident, he stated " the operation at any time is dependent upon single

[9]A truck with retractable flanged wheels so that it may be used on either highway or track

actions of individuals, and I don't draw a distinction between that and what happened out at (Russell)

Meteorological Information

Conditions at Russell were quite similar to those at Ottumwa, the nearest reporting station, about 35 miles east of Russell Surface observations reported by the National Weather Service at Ottumwa, on October 12, 1987, between 0950 and 1150 were clear sky, 20 miles visibility, and temperatures of 47° F to 58° F

Method of Operation

The accident occurred on the First Subdivision, Galesburg Division, Chicago Region of the BN The First Subdivision of the Galesburg Divison extends from Creston, Iowa, at MP 391, to Galesburg, Illinois, at MP 162 4 Train movements are governed by Operating Rules, Timetable Special Instructions, Track Warrants, Track Bulletins, ABS system signal indication, CTC signal indication, and verbal instructions issued by the dispatcher via radio

The BN dispatcher, located in Galesburg, controls train movements over the First Subdivision He is responsible for issuing the necessary track warrants and track bulletins Track bulletins that go into effect on any given morning are generally issued by the dispatcher on the afternoon shift the previous day to ensure that all trains will have a copy of the bulletin when it becomes effective The night duty and day duty dispatchers are required to read track bulletins that have been issued and make the appropriate notation that the bulletins have been read

At 1001 on September 27, 1987, the Track Warrant Control (TWC) system of directing the movement of trains went into effect on the Galesburg Division BN conducted special classes from September 21 through September 25, 1987, to familiarize their operating employees with the TWC system Each operating crewmember of train 6, the BN pilot, and the BN dispatcher had attended one of these classes

Under the TWC system, dispatchers issue various track bulletins to traincrews to inform them of special track conditions that affect the movements of trains Track Bulletin Form D contains information on temporary speed limits, tracks out-of-service, special instructions, and unusual conditions Train 6 had been issued Track Bulletin Form D No 1112 dated October 12, 1987 The only item involving the area between Chariton and Russell stated that the eastward stub at Russell was out of service (See appendix C)

Track Bulletin Form B contains information specifically about maintenance-of-way forces working on main tracks This document specifies maintenance-of-way work limits, time limits, tracks involved, and the foreman's name It also states that within these limits, train movements will be governed by operating rule 455 Train 6 was issued two Track Bulletin Form Bs Nos 1116 and 1118 Only items on lines 3 and 4 of No 1116 affected the area from Chariton to 5 miles east of Russell These were for the grade crossing replacement at Russell and the rail replacement east of Russell (See appendix C)

Once a Track Bulletin Form B becomes effective, the train dispatcher cannot authorize a train to move through the work limits The dispatcher on duty when the accident occurred testified " as far as the Form B and letting trains through, it's under his [the track foreman's] control between his limits he decides what trains can come through " The track foreman also determines the speed for the train if he orders a speed other than restricted speed The dispatcher stated that he is not made aware of the reasons for the Form B, such as equipment fouling the track, the speed ordered by the foreman to the train, or whether the foreman has installed the prescribed flags The division superintendent testified that the track foreman in charge of the Form B is responsible for

the movement of trains through his work area, much as a dispatcher is responsible for train movements over the railroad

The dispatcher is also responsible for issuing a train "line-up" The line-up, form No 100, used by track foremen in their work, shows train movements by train identification, direction, track, and priority Generally, two line-ups are issued each day, the first, between 0500 and 0630, is good until 1230, and the second, issued between 1100 and 1200, is good until the latest time maintenance-of-way forces will be working on the track The line-up is sent electronically to various stations on the subdivision, where maintenance-of-way personnel pick up their copy The track foreman in charge of the grade crossing work at Russell picked up a line-up from the Chariton operator and signed for it before he left Chariton

The Amtrak engineer stated that he had made six round-trips over this territory In a letter received by the Safety Board (dated December 30, 1987), the President of Amtrak stated " BN currently requires our engineers to make three round trips in order to qualify, Amtrak recently implemented a policy that requires four round trips " However, the BN allows any Amtrak engineer to be accompanied by a pilot engineer until the Amtrak engineer feels that he is well enough acquainted with the physical characteristics to operate alone The Amtrak engineer stated that he had to become familiar with about 625 miles of railroad when he started service with Amtrak He had made trips over all this mileage and had qualified on two subdivisions, but was not qualified on the Lincoln or Galesburg subdivisions, therefore, a BN pilot was assigned to train 6

The BN dispatcher's tape for October 12, 1987, from 0730 to 0800 contains a discussion between the dispatcher and the operator at Chariton concerning the reverse moves, through a trailing point crossover, that would have to be made at Chariton for eastward trains and that " the one lined the right way is at 333 2 " Both the operator and the dispatcher agreed that " we didn't show it that way in the line-up it was supposed to show Chariton both directions " They further agreed that they would have to back eastbound trains through the crossover at Chariton, but that " This afternoon I'll [dispatcher] change it and make it 333 2 to Halpin

Extra BN 7200 East, a cabooseless coal train that was about 1 mile long, was the first train to be reversed at Chariton It had been operating eastbound on the eastward track from Creston to Chariton As Extra BN 7200 East proceeded east of MP 334 5 at Chariton, the head end of the train entered into another ABS signal block To cross from the eastward to the westward track, it had to back through the crossover at Chariton, with its rear end traveling across an at-grade crossing protected with automatic flashers and gates, and into the westward ABS signal block beginning at MP 335 4 This reverse move was made without any crewmember observing the movement of the rear of the train The division superintendent testified, " I presume that one track warrant gave him permission to get to the crossover and the other got him through the crossover and on east " When asked about his concerns of the mile-long coal train on the eastward main track where it had no authority, the division superintendent stated

> I don't know if -- most of them I have seen would say at Chariton, for example, to go to milepost -- a certain milepost on eastward is sufficient that he could clear himself, and then the track warrant on the westward track would start sufficient that again he was clear the entire time We attempt to have a train, when we use a track warrant, to have the train protected

The division superintendent stated that there were two reasons for not using the facing point[10] crossover at Chariton (MP 333 2) on the morning of the accident, "First of all, the operator we had

[10]A track switch in which the switch points face traffic approaching in the direction of travel

out there, the station at Chariton allowed him a telephone and a Fax machine, secondly, with cabooseless operation, facing points these days don't save us much time " The division superintendent stated that the decision was management's prerogative and that they had encountered no problems reversing through trailing point crossovers The operator assigned to Chariton had a portable radio and a vehicle

Track warrant 822 was issued to train 6 at 0917 The BN pilot delivered it to the conductor and engineer at Creston at 1018 The track warrant authorized train 6 to proceed from MP 391 to the crossover at Chariton on the eastward track and notified the crew that track bulletin Nos 1112, 1116, and 1118 were in effect (See appendix C) At 1058, train 6 received track warrant 829 via radio, while en route at Osceola, authorizing the crew to proceed from the crossover at Chariton to CTC Halpin on the westward track At 1101, track warrant 830 was issued, authorizing the crew to proceed from CTC Maxon to MP 168 4 on the eastward track (See appendix D)

Medical and Toxicological Information

The Lucas County Health Center treated and released persons who sustained a variety of lacerations, abrasions, contusions, fractures, strains, sprains, and other minor injuries Ten persons were admitted to the Lucas County Health Center with a variety of injuries reported as acute cervical strain, acute costal chondritis of the ribs, separation of the ribs, heart dysrhythmia, acute somatic musculoskeletal dysfunction of the spine, mild concussion, rib fractures, uncontrolled hypertension, liver and spleen contusions, and acute reactional anxiety Eight persons were discharged on October 13, 1987, and two persons on October 15, 1987

Two persons were admitted to Mercy Hospital Medical Center in Des Moines, Iowa One was admitted with multiple soft tissue injuries and was discharged on October 14, 1987 The other was admitted with blunt abdominal injury, possible concussion, and a neck strain, he was discharged on October 15, 1987

A passenger was admitted to the Iowa Methodist Medical Center in Des Moines with blunt abdominal trauma and a contusion and abrasion to the right hand She was discharged on October 15, 1987

Toxicological specimens of blood and urine were obtained from the three locomotive crewmembers, conductor, and two assistant conductors under FRA toxicological testing requirements of 49 CFR Part 219 Subpart C (See appendix F) The specimens were taken between 1545 and 2040, or more than 4 to 9 hours after the accident [11] These specimens were examined for the FRA at the Center for Human Toxicology (CHT), Salt Lake City, Utah No alcohol or other drugs were detected in any of the specimens

Toxicological specimens of blood and urine were obtained from the track foreman, crane operator, and laborer between 1425 and 1440, or about 3 hours after the accident The maintenance-of-way employees were told that they were to provide specimens under BN policy and procedures, revised December 1, 1986, concerning the control of drugs and alcohol in railroad operations These specimens were tested for the railroad by an independent laboratory using EMIT [12] No alcohol or other drugs were detected in any of the specimens

BN sent portions of the same specimens to CHT for testing, but failed to include the appropriate instructions These specimens, along with those tested by the independent laboratory, were

[11]The engineer, fireman, and pilot were tested between 1545 and 1620, the conductor and two assistant conductors were tested between 1705 and 2040

[12]Test conducted using homogeneous enzyme immunoassay, EMIT is a Syva trademark

obtained by the Safety Board and sent to CHT for analysis using a more sophisticated analytical technique [13] The blood and urine of the laborer were found to contain the carboxylic acid metabolite of delta-9-tetrahydrocannabinol (marijuana) 4 8 ng/ml in the blood and 4 0 ng/ml in the urine The urine of the crane operator was found to contain salicylate (aspirin)

BN policy and procedures for the control of drug and alcohol abuse follow the same requirements as 49 CFR Part 219 BN rules are more restrictive than the Federal regulations in that they prohibit employees on company property in a private vehicle or in a company vehicle under the influence or while in possession of an illegal controlled substance or alcohol

Rule G and Safety Rule 565 (BN refers to these rules collectively as "Rule G") govern Engineering and Maintenance-of-Way employees of the BN Effective February 1, 1987, Rule G in the General Code of Operating Rules and Rules of the Maintenance-of-Way, Rule 565 in the Safety Rules and General Rules as modified in current timetable was changed to read (see appendix G)

> The use of alcoholic beverages, intoxicants, narcotics, marijuana or other controlled substances by employes subject to duty, or their possession or use while on duty or on Company property, is prohibited
>
> Employees must not report for duty under the influence of any alcoholic beverage, intoxicant, narcotic, marijuana or other controlled substance, or medication, including those prescribed by a doctor, that may in any way adversely affect their alertness, coordination, reaction, response or safety

The division superintendent testified that the maintenance-of-way employees were tested because " we felt there was a direct involvement with the accident " He stated they were tested under BN's policy

The FRA's toxicological testing requirements apply only to covered employees directly involved in an accident

> 49 CFR 219 5 defines "Covered Employee" as a person who has been assigned to perform service subject to the Hours of Service Act during a tour of duty
>
> 49 CFR 219 203(2) states " include each and every operating employee assigned as a crewmember of any train involved in an accident In any case where an operator, dispatcher, signal maintainer or other covered employee is directly or contemporaneously involved in the circumstances "

Survival Aspects

Most of the interior damage sustained by the lead unit 396 was on the fireman's side The sidewall was displaced inward from the rear of the fireman's door opening to the windshield post with a maximum displacement of about 2 inches at the post between the front and rear windows on the fireman's side (See figure 12) The top hinge of the fireman's door was broken and the door window was crazed The rear sliding window was crazed and the front sliding window was missing because it had been broken out in the accident The fireman's windshield was removed when the crew evacuated the locomotive There was a "spider web" crack at the bottom center of the engineer's windshield

[13] GC/MS - Gas chromatography/mass spectrometry

Figure 12 --Interior of the fireman's side of locomotive.

In the coach/dorm car, the seat locks were broken at seats 5/6 and 21/22. Five other seats were turned, but the locks were not broken The upper door glass was not present on one end. In the coach cars, the seats were turned without damage to seat locks and several cars had damaged and inoperative seat locks. Coach 39957 had six turned seats. Coach 34076 had six turned seats. In addition, seats 7/8, 13/14, 15/16, 25/26, 45/46, and 47/48 had damaged and inoperative seat locks. (See figure 13.) The tops of the seat cushions were dislodged from the frame and the sheet metal supports were exposed at seats 3, 18, 52, 55, and 61. (See figure 14.) Coach 34065 had 10 turned seats. Seats 43/44 and 65/66 had damaged and inoperative seat locks; the tops of the seat cushions were dislodged from the frames and the sheet metal supports were exposed at seats 4, 26, 44, and 54. Coach 34014 had six turned seats. Seats 5/6, 25/26, 49/50, and 63/64 had damaged and inoperative seat locks. Coach 34027 had two seats turned and seats 75/76 and 77/78 had damaged and inoperative seat locks on the upper level. The top seat cushion on seat 80 was dislodged, exposing the sheet metal support; the lower level had 11 seat pairs turned, and seat 3/4 had a damaged and inoperative seat lock

Six emergency windows in sleeping car 32048 were not in place In room 6, a portion of the interior wall had been cut away by rescuers. In room 7, the room/hallway glass partition had also been cut away by rescuers.

The lower level of lounge/cafe car 33004 had two microwave ovens without restraining straps, but both were still in place Three rear refrigerator doors were loose and the hinges were broken at the upper pivot. The upper level of the lounge/cafe car had television sets at both ends of the car. The television sets were mounted in a recessed area on short pedestals. At the top of each pedestal was a metal plate to which the television was attached by four sheet metal screws, which passed through drilled holes in the plate and screwed into raised molded plastic bosses (enlarged part of base) on the bottom of the television All four bosses were broken off and both televisions were

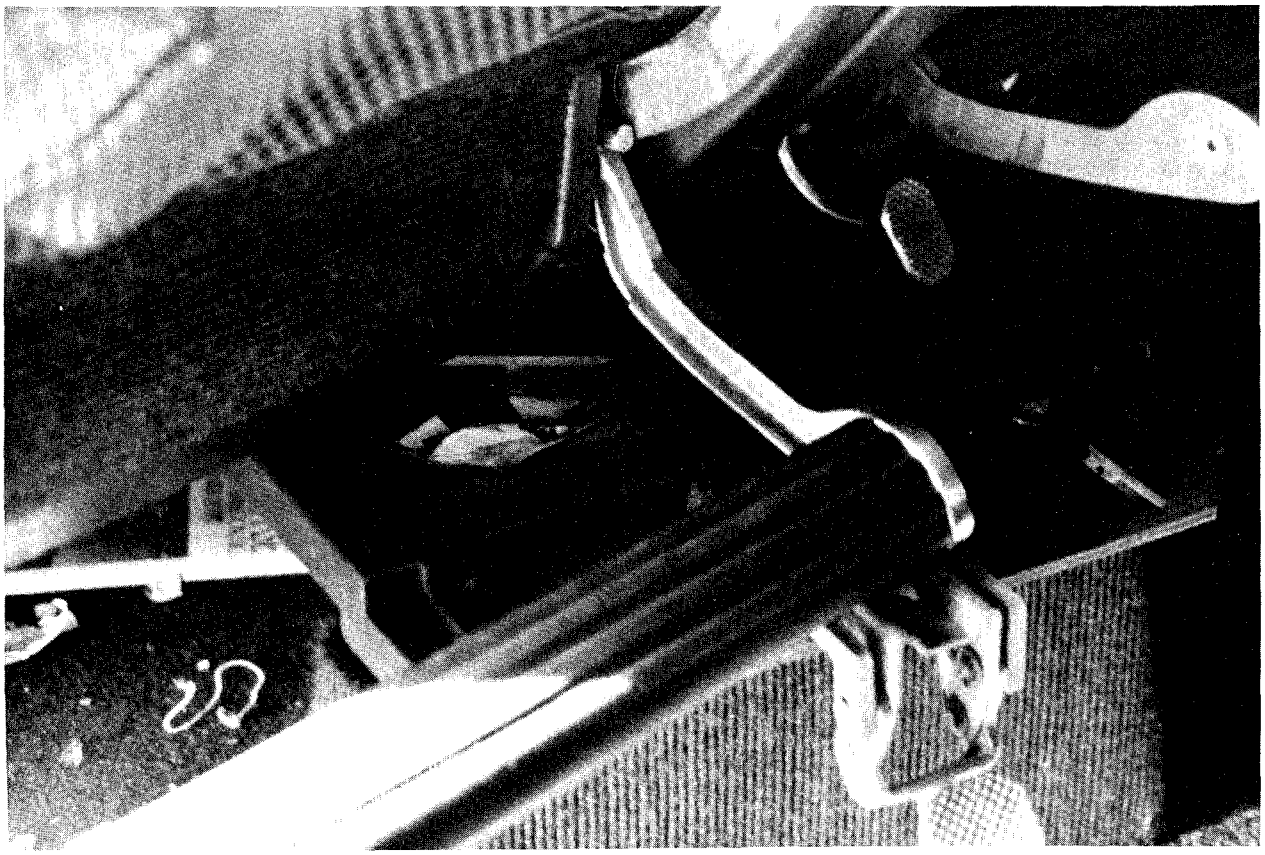

Figure 13.--Typical damage, inoperative seat lock.

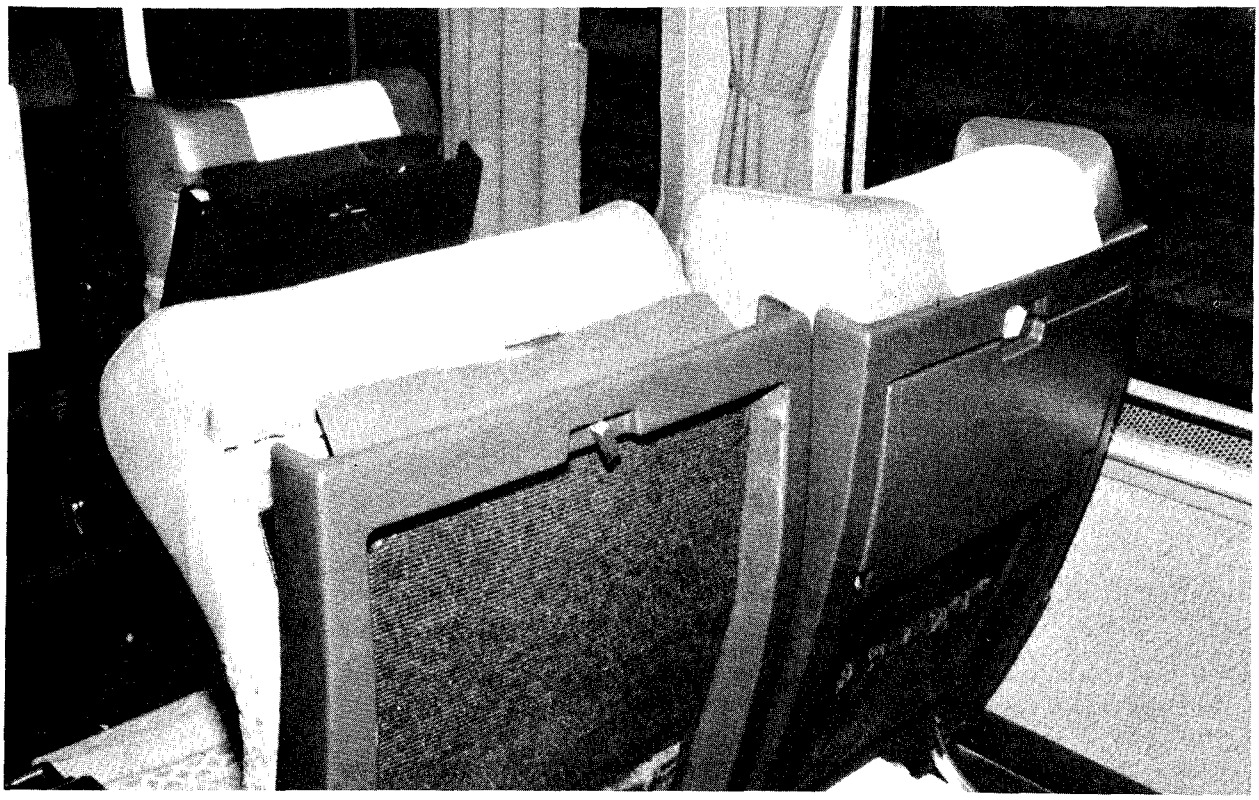

Figure 14.--Typical damage, top seat cushion support with exposed sheet metal strip..

found on the floor of the car. (See figure 15) In addition, three coffeemakers were found on the floor of dining car 38023.

At the Safety Board's deposition proceedings, an Amtrak representative was asked about the performance and modifications in the Amfleet and Superliner cars for seats and the seatlocking mechanisms. Amtrak furnished the following information:

> In early 1981, a seat lock was developed by AMI Corporation. . after a period of time, it was determined that these AMI locks were unsatisfactory. Coach and Car Corporation developed a lock that had more positive securement . .Amtrak specified the lock when making the purchase of Amfleet II cars. . delivered through 1983. .in addition seats were purchased. . .to replace deteriorated seats in Amfleet I cars . .these additions have been made throughout the period when the six-year overhaul program began in late 1984 Trison Company [second source of supply] developed a lock mechanism similar to the Coach and Car device. . .delivery will commence June 1988.

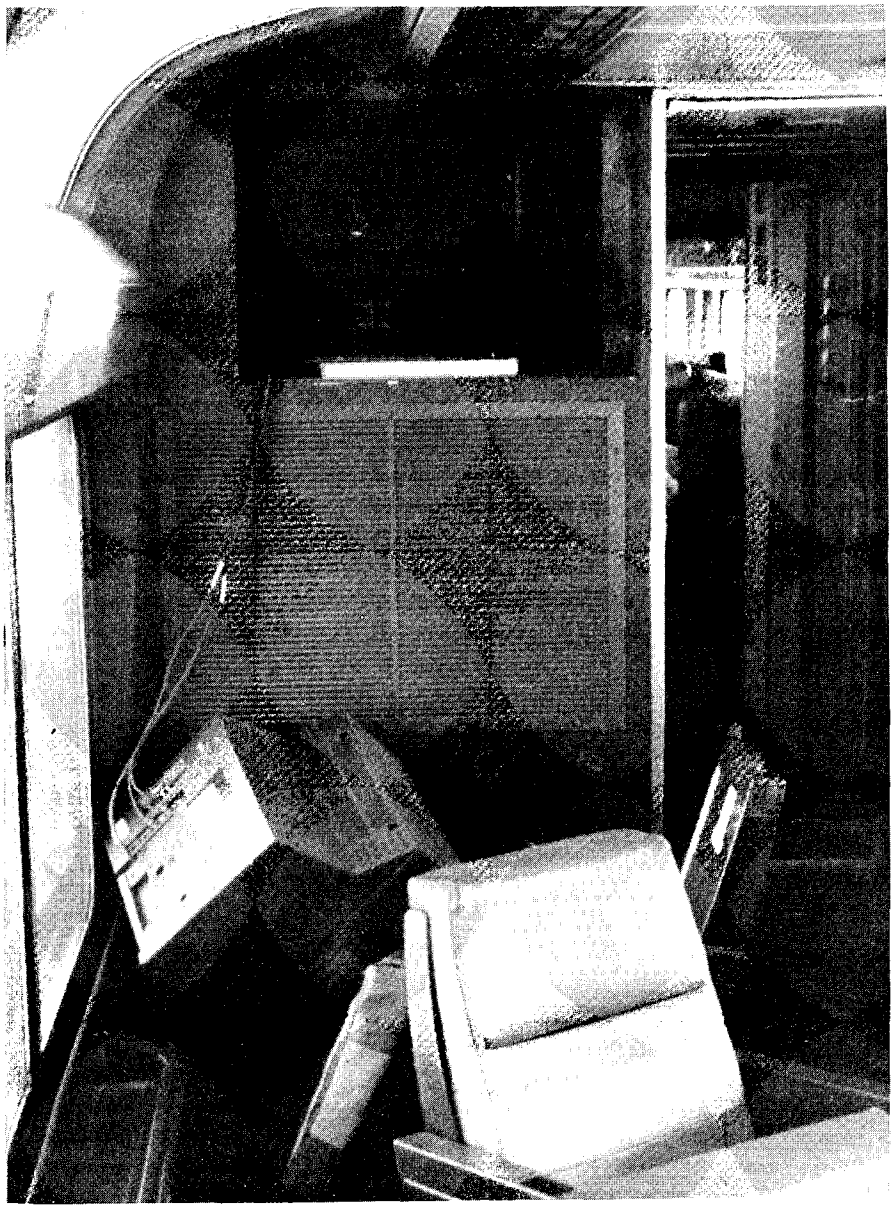

Figure 15.--Interior of AMT 33004 lounge/cafe car.

Amtrak provided the Safety Board with the following account of the status of the seat lock replacement program Amtrak anticipates that the replacement will be complete by September 30, 1989

Car type	Total fleet	Completed	To be completed
AMF I	476	174	302
AMF II	124	124	0
SUPER	150	0	150
	750	298	452

At or just after impact, the engineer, fireman, and pilot felt the locomotive roll to the north and slide onto the fireman's side of the locomotive They were thrown to the left, the fireman's side of the locomotive When the locomotive came to a stop, the engineer noted that the BN pilot appeared to be injured The fireman opened interior compartment doors located at the back of the cab compartment that lead to the electrical switches and, using them as a ladder, climbed up to the engineer's side, opened the door, and climbed onto the side of the engine The engineer, meanwhile, got the cab fire extinguisher, broke out the fireman's windshield, and started to remove the BN pilot from the cab compartment Seeing this from above, the fireman climbed back down into the cab and assisted the engineer

Passengers reported feeling the sharp application of brakes, followed by one or more sharp jolts, with the last jolt being the most severe During the derailment sequence, passengers were thrown about, and struck the floor, seats, tables, and other furnishings or other passengers No passengers reported being struck by loose luggage that had been ejected from overhead racks, only four passengers reported seeing carry-on articles being thrown about The 29 passengers who could recall specifically how they were injured reported that their injuries occurred as a result of secondary impacts with interior surfaces or other passengers

Emergency Response

The accident was observed by a member of the Russell Volunteer Fire Department (RVFD) from his home, which was adjacent to the track During the investigation, he stated, "There was a big bang and a flash Then an explosion I learned later that a propane tank had been hit and exploded Lucky that the diesel fuel didn't ignite After that, everything was very quiet " He ran to the scene, made a quick evaluation of the situation, then ran about two blocks to the firehouse

The initial response to the accident consisted of fire, rescue, and police units, including the county sheriff The sheriff was notified by radio about 1139 and immediately activated the Lucas County Emergency Plan, which was later scaled down to a partial activation

The first emergency units on scene were a pumper and a first-aid truck from the RVFD and a police car from the Russell Police Department While the police secured the area, the RVFD began fighting the fire, which involved a small propane tank, and tended to the injured When the sheriff arrived at about 1145, Emergency Medical Technicians (EMT) were tending to the injured and the Mercy Med Center helicopter was already in the air headed for Des Moines

The sheriff estimated that about 15 to 20 agencies responded, with a total of about 100 persons and 10 to 12 ambulances The only fire equipment that responded was the RVFD and the Chariton

Volunteer Fire Department The State of Iowa Office of Disaster Services offered its assistance, but officials on the scene determined that it was not needed

Following the rescue operation, a critique session was held at a regular monthly meeting of the Lucas County emergency forces The only problem assessed was the unusually large number of x-rays requested at Lucas County Memorial Hospital and the insufficient number of x-ray technicians to provide them

All but two of the injured walked or were helped off the train through the lower vestibule doors The two more seriously injured persons, who were located on the upper level of sleeping car 32048, were removed through an emergency window One was located in bedroom 7 and the other, who had been in bedroom 10, was found in the hallway where she had been thrown and where she remained until removed by rescuers Because of their suspected injuries, these two persons were placed on backboards, however, the backboards could not be maneuvered down the steps to gain access to the vestibule door nor into any bedrooms to gain access to the bedroom's emergency window Therefore, the rescuers cut away part of the hall partition in bedroom 7, which allowed them to maneuver the backboard to an emergency window Bedroom 7 was chosen because that would require the injured to be moved the least The injured were then lowered to the ground in the bucket of a front-end loader

All passengers who walked off the train were directed by crew and rescuers to the south side of the tracks, where they could be assisted and triaged The passengers were triaged at the scene and transported to area hospitals according to the severity of their injuries Three injured persons were transported by helicopter to two hospitals in Des Moines, about 100 miles from the accident The helicopter landing site was in a pasture adjacent to the train on the north side of the track The remainder of the injured were transported to the Lucas County Health Center in Chariton, about 8 miles away Persons who were not injured were transported by school bus to the school in Russell All persons had been transported from the accident scene by 1430 and the emergency operation was terminated at 1630

The Lucas County Multi-Hazard Operations Plan was completed in September 1987 County-wide drills were conducted in March and June 1987 The excercise on June 16, 1987 included the Lucas County Hospital, emergency medical services, volunteer fire personnel, the County Emergency Manager, the police, the sheriff's department, and others The drill's scenario was a tornado (mass casualty) and the incident area involved the community of Russell Mutual aid and distribution of resources were among the problems coordinated during the excercise Also addressed during the excercise were dealing with an overload of patients at the hospital, accounting for the injured, and setting up a public information center

At least four persons from Lucas County who worked directly with emergency management during disasters had received training at the State level on coordination of resources and personnel involved when emergencies reach disaster proportions

Tests and Research

On October 15, 1987, between 1500 and 1530, Safety Board investigators performed a sight distance test The weather was clear and sunny The low short hood of the BN GP-38 locomotive was facing east and the train was operating on the westward track Three ballast cars, painted black, were placed on the west stub track about 150 feet east of the switch The switch to the west stub track was set for the diverging route into the stub track The tests showed that the open switch points were visible about 639 feet from the switch stand and the red, partially rusted 8-inch by 36-inch switch banner was visible about 859 feet from the switch stand

Amtrak provided stopping distance curves for train 6 using standard stop distance calculations from the Air Brake Association "Engineering and Design of Railway Brake Systems " The stopping distances were developed using the known values for the car weights and braking forces for given speeds for both emergency and full service braking levels At 60 mph, the stopping distance at the emergency braking level was computed to be 1,237 feet and at the full service braking level, 2,042 feet

Safety Board investigators examined the BN switch lock and found no visible signs of tampering or malfunction The BN is the only railroad, according to the lock manufacturer, that has a removable switch lock key when the lock is open According to the manufacturer, "In all cases, except Burlington Northern, the railroad padlock has been sold as key retaining the key is retained in the lock and cannot be removed " The BN initially requested a key removable lock, which they later found unsatisfactory The present lock was developed for BN as key removable, but, with the key removed, the shackle is in a fixed, locked open position

On October 15, 1987, Safety Board investigators conducted airbrake and radio tests on train 6 The testing indicated that the radio equipment was operational and the brake equipment was working properly Examination of records for Federally required inspections and tests indicate that the train equipment was in compliance at the time of the last inspections and tests before the accident

The speed and event recorder data packs were removed from both the lead and trailing units These were read out on normal and expanded strip charts by Pulse Electronics, Inc , and by the Safety Board laboratory in Washington, D C The data pack was removed from lead unit 396, but the portion of tape that was still in the recording heads had been damaged When the strip chart of the undamaged portion of the data pack from unit 396 was compared with that of unit 357 by overlaying one over the other, the recorded speed trace of the two units agreed, except for the last 36 to 37 hours on unit 396 when the recording unit did not record zero when the locomotive was stopped, however, the strip chart of unit 357 could be used to provide speed trace results for the damaged sections of the tape on the lead unit The calibration tests of the recorders from both locomotive units indicated that they were within the manufacturer's 3-percent tolerance specification for accuracy

Observation of the strip chart disclosed that the locomotive speed at the moment of emergency braking initiation was about 60 mph The locomotive speed trace of the strip chart revealed that the rate of deceleration was fairly constant until approximately 23 mph (See appendix H)

ANALYSIS

General

The Amtrak operating crew and the BN pilot were rested in accordance with applicable regulations They were qualified on the operating rules and experienced in passenger train operations Although the Amtrak engineer had not requested to be qualified on the physical characteristics of this subdivision, he had made more than the required number of round trips to become qualified He stated that, "Each engineer when he feels comfortable with running over the territories [Amtrak supervision] will contact the BN they will assign a road foreman to say whether we are qualified or not "

No anomalies or deficiencies were noted in the track structure or track geometry that could be considered causal to this accident The ABS system was signalled for each track in the designated direction of traffic and the west stub track switch was configured to be a trailing point switch on the westward track The signal system did not provide protection for trains operating against the designated direction (current) of traffic and therefore no indication was given that the switch was in the reverse position In that regard, the signal system was not involved in the operation of trains and cannot be considered a factor in this accident Also, no mechanical defects on the locomotive or passenger cars were found that would have been causal to the accident

The Accident

As they approached Russell, the crewmembers of train 6 were operating the train in accordance with the BN operating rules and instructions BN timetable No 6, which provides speed restrictions for the First Subdivision main track of the Galesburg Division, authorizes a maximum allowable speed of 79 mph for passenger trains, except for those moving against the current of traffic, for which the maximum allowable speed is 59 mph

Form B track bulletin No 1116 provided for the protection of maintenance-of-way personnel working on or near the main tracks The Form B gave the track foreman the authority for the track and mandated the procedures the traincrew and the track foreman were to follow to move a train through the work area The pilot of train 6 contacted the track foreman listed on the Form B for the first work area east of Chariton in accordance with the rule When the track foreman authorized train 6 to proceed through the work area at normal speed without stopping at the red board, the traincrew had no reason to expect that a switch would not be properly lined for the main track

The track laborer acknowledged that he failed to return the west stub track switch to its normal position when the crane was moved into the stub track to clear the westward main track for train 6 As a result, train 6 was diverted into the stub track where it collided and derailed with the crane The track foreman authorized train 6 into the work area without personally ensuring that the track was safe for the movement he authorized

Train 6 approached the west stub track switch at a speed of about 60 mph, a speed that did not permit the locomotive crew sufficient time to identify, react, and stop the train before it reached the improperly lined switch Amtrak calculated the stopping distance at an emergency braking level that compared with the calculations based on accepted engineering standards using data from the event recorder (See appendix I) The emergency braking level for train 6, computed to be 1,237 feet, is greater than the sight distance to either the switch banner (859 feet) or the switch points (639 feet)

At the speed train 6 was authorized to operate through the work area, unforeseen circumstances such as in this case an improperly lined switch or men and/or equipment that have not cleared the track, can arise too quickly for a traincrew to have time to take proper action

The Form B, which is used to protect maintenance-of-way workers and equipment on the track, allows passenger trains to be authorized through a work area at 59 mph on nonsignalled track and at 79 mph on signalled track Freight trains, which may require a longer distance to stop, even though the maximum speeds are lower, are restricted to 49 mph and 60 mph (for the same conditions, except when special instructions require lower speed limits) Freight trains can also be authorized through a work area at maximum speed

The Safety Board believes that the provisions of the Form B authorizing trains through a work area, whether the track is signalled or nonsignalled, at the maximum authorized speed is an unsafe operating practice This practice effectively reduced the ability of the locomotive crew to see the equipment and switch banner ahead in time to stop the train before it reached the improperly lined switch, thereby eliminating the last chance to avoid the accident The Safety Board concludes that the rusted red switch banner failed to provide visual contrast to its background, preventing the crew from identifying the position of the switch at a distance that would have permitted them to stop or significantly slow the train

Maintenance-of-Way

Operations --To protect the maintenance-of-way employees and equipment that would be working on the at-grade crossing replacement and switch relocation at Russell on October 12, 1987, the roadmaster in charge of the Russell area requested a Form B track bulletin on October 9, 1987, according to Rule 455 of the BN maintenance-of-way rules That rule provided three options for train and engine speed through the limits of the work area the Form B was to protect Since the preparatory work for the grade crossing rehabilitation project would not, and ultimately did not, disturb the track structure or geometry, the roadmaster chose not to restrict train speeds

The BN maintenance-of-way rules also provide for the display of a red flag at prescribed locations to define the limits of a work area Trains must stop short of the red flag and not proceed unless authorized by the track foreman The Safety Board considers the display of a red flag at a prescribed location to be a fixed signal that indicates conditions that would affect the movement of a train Both the engineer and BN pilot of train 6 interpreted the red flag the same way, however, the BN division manager of safety rules disagreed with this interpretation The Form B provides for authorizing trains to proceed past a red flag without stopping when so authorized by the track foreman, and at a speed determined by the track foreman The track foreman makes this determination based on his experience for track conditions and the type of work being performed He can authorize a speed ranging from a speed less than restricted speed[14] to the maximum authorized speed for that track Under certain circumstances, a train dispatcher may authorize a train to proceed through a red signal after stopping, however, in these instances, the dispatcher can only authorize the train to proceed through the signal at restricted speed The Safety Board concludes that had train 6 been authorized to operate through the Form B work area at restricted speed, the engineer would have had time to stop his train when he saw that the switch was improperly lined for the main track

The Form B in effect at the time of the accident referenced the name of the track foreman as the person a train crewmember would have to contact to obtain permission to proceed through the limits of the Form B order According to BN rules, no other person was authorized to grant such permission The Safety Board is concerned that the track foreman, who was not experienced in train operations, authorized a train to pass a red flag without stopping and to proceed at speeds greater

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[14]A speed that will permit stopping within one half the range of vision short of train engine, railroad car, stop signal, derail, or switch not properly lined, looking out for broken rail, not exceeding 20 mph

than restricted speed The Safety Board is especially concerned because this commonly used practice was established by BN management, and the track foreman was simply complying with this accepted practice The Safety Board believes such a practice degrades the safety of train operations and the safety of maintenance-of-way employees

The authorization for the passage of trains through a work area must provide for the protection of not only the men and equipment in the work area, but for the safe operation of trains The Safety Board recognizes that other railroads require that a train approaching a work area reduce its speed and be prepared to stop at the limits of the work area, with the speed of a train through the area being prescribed by train order, not the track foreman One railroad using the Form B track bulletin stated that the use of normal track speed is the exception and that restricted speed is generally used when men and equipment are in the work area The Safety Board believes that the Form B needs to be changed to limit the speed of a train through a work area to restricted speed

Although the Form B order establishes time limits and specifies the placement of red, yellow, and green flags, those flags had not been placed by the established time on the day of the accident Rather, the track foreman placed the flags as the track crane traveled along the track This laxity indicated a casual attitude on the part of BN supervision, and consequently on the part of rank and file employees in the maintenance-of-way department This attitude was further demonstrated when the track foreman authorized Extra 7200 East through the work limits of his Form B order while he was still in Chariton, about 7 miles from the work area The Safety Board recognizes that circumstances may develop that require track foremen to be at locations other than those specified on the Form B within the specified time limits, however, the Safety Board believes that in this case the track foreman should have had that portion of Form B annulled and reissued later The BN maintenance-of-way supervision should not accept the practice of authorizing trains through a work area unless the track foreman is present at the work area

A further indication of a lack of adequate safety precautions was the BN failure to place the eastward main track east of Russell out of service even though workers were replacing rail at that location The eastward main track had been taken out of service west of Russell to MP 333 2, the BN was unable to provide any reason for taking that track out of service This may indicate that the BN maintenance-of-way management was not properly overseeing its own operations

The BN roadmaster testified that the track switch to the west stub track was spiked out-of-service because occupied maintenance-of-way camp cars were on the stub track at Russell However, he also stated earlier that the switch had not been spiked out of service BN rules require that any track wherein occupied camp cars are placed be taken out of service for the protection of camp car occupants Given the conflicting testimony concerning whether the track switch was spiked, and the absence of written orders protecting the equipment on the stub track, it may be concluded that the west stub track was not taken out of service

Because the switch banner was partially rusted, it was difficult to see against the background, including the track crane As a result, the crew of train 6 had little opportunity to take advantage of this warning of the track switch position The traincrew testimony indicated that the switch point position was the first visible sign they had that the switch was open to the stub track The use of reflective material on the switch banner would have enhanced the visibility of the banner

In anticipation of the arrival of train 6 at the work site in Russell, the track foreman instructed the crane operator and the laborer to place the crane in the clear at the west stub track They had earlier placed two flat cars, which they had used to transport material to the work site, into the stub track The safe placement of the crane and the flat cars was the crane operator's responsibility, in conjunction with the laborer However, neither of them checked the position of the track switch leading from the main track to the west stub track In fact, the laborer acknowledged that he failed to position the switch properly in compliance with applicable rules The crane operator also should

have been diligent when placing his equipment in the stub track to check that the switch was properly positioned to protect his equipment and ensure the safe passage of trains on the westward track Further, the track foreman, when picking up the crane operator and the laborer at the grade crossing at the stub track, also neglected his responsibilities in checking the track switch for the safe operation of trains through the limits of his work area as he admitted in his statement to the roadmaster following the accident The Safety Board believes that the track foreman had the ultimate responsibility for the correct operation of the switch by an employee under his supervision Such laxity on the part of the three employees further reflects an attitude by BN maintenance-of-way management that rules enforcement and compliance was not of the first order of importance

Management Oversight of Maintenance-of-Way Rules --Before adopting the General Code of Operating Rules, the BN conducted rules classes for its employees These classes were to cover not only the introduction of Form B track bulletin orders, but other rules changes, according to BN officials However, the BN did not provide the Safety Board with any documentation for special rules classes, except for a class on how to use Rule 40 and a 4-hour review of rules before the rules qualification examination

BN officers testified that after employees took the written qualification rules examination, they were permitted to review it and correct their mistakes before the grade was recorded This was confirmed by personnel records, which showed a score of 100 percent for each employee taking the test The Safety Board questions the validity of such a procedure to ensure that maintenance-of-way employees so qualified understand the practical applications and requirements of the rules

The Safety Board also believes that classroom testing and rules examinations should be conducted in conjunction with other teaching methods such as simulated exercises Accident investigation history has revealed that even though employees are able to memorize operating rules and pass examinations, they may be unable to apply these rules in practice As a result of its investigation of an accident in New York City on July 23, 1984,[15] the Safety Board recommended that the Association of American Railroads (AAR)

> R-85-84
>
> Review member railroads' current methods of conducting operating rules classes and administering tests for deficiencies and develop model instruction and testing procedures that will require employees to demonstrate that they not only know the wording of the operating rules but that they understand how the rules are to be applied both in normal and emergency operating conditions Disseminate the model program to member railroads and encourage them to adopt the program

The AAR responded to this safety recommendation a number of times The most current letter was of May 18, 1988, which transmitted the results of a questionnaire sent to eight U S railroads representing 60 percent of the U S rail mileage The Safety Board reviewed the May 18 letter and replied on July 25, 1988

> the Board finds it difficult to reach the conclusion that the railroads are providing quality rules instruction for their employees based on the questions posed to and the answers received from the representatives of eight United States railroads at the May 4, 1988, meeting of the AAR's Operating Rules Committee Our accident investigations continue to indicate otherwise Furthermore, the

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[15]Railroad Accident Report--*Head-On Collision of National Railroad Passenger Corporation (Amtrak) Passenger Trains Nos 151 and 168, Astoria, Queens, New York, New York, July 23, 1984* (NTSB/RAR-85/09)

> Board sees no meaningful information gained from the questionnaire that was presented to the railroad representatives
>
> The Board does not agree that this questionnaire can be termed " an in-depth followup to determine if the minimal guidelines are being met ," as was suggested in our September 27, 1987, letter We would suggest that further and closer observation of actual rules classes and testing procedures would be more indicative of an "indepth followup " While the AAR considers the Board's comments, Safety Recommendation R-85-84 will continue to be held in an "Open--Acceptable Alternate Action" status

As a further note to highlight the Safety Board's concern for the need for railroad employees to fully understand operating rules and the impact these rules can have on railroad safety, the Board's reply to the AAR contained the following

> After reviewing the questions posed to the railroad representatives, the Safety Board notes a broader and more general concern Accident investigation experience has shown us that an effective training program must reach beyond classroom instruction Your questionnaire seemingly evaluates a rules instruction program solely from the standpoint of classroom coverage and we see little benefit in that kind of a review There are a number of other factors that, if not emphasized, can undermine or negate the effectiveness of a rules instruction program, including, but not limited to 1 lack of followup on-the-job supervision, 2 supervision which ignores or takes no action with respect to rules violations, and 3 lack of meaningful disciplinary action for rules violations
>
> If a train crew understands that they will routinely encounter supervisory personnel and that supervisory personnel are consistent in citing rules violations with appropriate meaningful disciplinary action, there is an incentive for employees to understand and follow those operating rules Put another way, the testing procedures of an effective rules program should extend beyond the classroom to the operating environment so that employees are consistently monitored and checked on their knowlege and adherence to operating rules The Board found in its investigation of the accident at Pine Bluff, Arkansas, on June 9, 1985,[16] that management provided only part-time rules enforcement efforts by an inadequate supervisory staff, an inconsistent policy of rules enforcement and discipline, and a tendency toward leniency which mitigated the effect of discipline
>
> In short, the Board believes there are a number of factors, in addition to the minimal standards previously developed, that the AAR should look at and take into consideration in determining the overall effectiveness of the rules instruction programs in the railroad industry

In this instance, employees were not even required to memorize the rules in order to pass the exam Thus, BN management acquired no true measurement of employees' knowledge of the rules The track foreman selected the laborer to accompany the crane operator and assist in the movement of the crane because, in the words of the track foreman, he was qualified because " He's had the Book of Rules and he's got switch keys

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[16]Railroad Accident Report--*Derailment of St Louis Southwestern Railway Company (Cotton Belt) Freight Train Extra 4835 North and Release of Hazardous Material Near Pine Bluff, Arkansas, June 9, 1985* (NTSB/RAR-86/04)

This casual attitude was further demonstrated by the BN method of performing efficiency testing of the track foremen When efficiency testing is properly administered, the track foreman is evaluated by his supervisor without prior notice for implementation of the applicable rules under actual operating conditions This provides an evaluation of the track foreman's understanding of the rules as well as a measure of whether the intent of the rules is being met

The two roadmasters conducted 20 efficiency tests of track foremen that included Rule 455 (Form B) Only three of the 20 tests were performed under the conditions of a train operating through the work area However, since none of the tests included testing for radio rules, it can be concluded that no evaluation was made of the track foremen for authorizing trains to enter the work area correctly and if the appropriate speed was prescribed, or if trains had actually been authorized into the work area

During the 8-month period before the accident, the efficiency tests performed by the roadmaster for the Russell area showed no failures to comply with the rules by maintenance-of-way foremen The track foreman involved in this accident had been evaluated only once on the application of Rule 455 while operating a hy-rail vehicle through a Form B work area assigned to another track foreman

The Safety Board believes that the failure to perform efficiency testing that fully encompassed the proper use of the recently introduced Form B indicated that BN maintenance-of-way management may have been lax in its oversight and enforcement of the rules

BN policies in implementing the Form B order according to Rule 455 of the maintenance-of-way rule book further indicates laxity on the part of management The passage of trains, especially passenger trains, through work areas at unrestricted speeds even in conjunction with Form B orders cannot be considered safe practice

The placement of flags at the limits of a work area covered by a Form B is prescribed as part of the requirement to provide information to traincrews of conditions affecting the movement of a train When flags cannot be placed or the location of flags overlaps, the dispatcher, when advised, is to obtain instructions from the maintenance-of-way foreman to relay instructions to traincrews On the morning of the accident, the track foreman had not placed his flags at the time designated on his Form B He was also unaware that his Form B work area overlapped the Form B work area of the rail-laying gang east of Russell Since the roadmaster had not properly evaluated the track foreman for Rule 10, Rule 10A (Temporary Restrictions and Red Flags), and Rule 455, he had no way of knowing that this track foreman may not have understood the rules or that he had to notify the dispatcher

The Safety Board believes that efficiency testing can be effective only when it is done under the circumstances for which the rules were designed The Safety Board concludes that BN maintenance-of-way management failed to properly administer effective efficiency testing that would ensure that employees were properly tested on the correct application of the rules and that the rules were adequately tested

Method of Operation

The chief dispatcher was informed by the roadmaster that the crossover at MP 333 2 had been repaired and returned to service before the accident Both the dispatcher and the Chariton operator recognized that the instructions issued to cross over trains to the westward track at Chariton on the morning of the accident were incorrect The instructions disagreed with the morning line-up, which showed that the crossover at MP 333 2 was to be used They discussed what had been shown on the morning line-up and determined that they would back eastward trains through the crossover at Chariton and that the dispatcher would issue correct instructions for the afternoon line-up to cross

over trains at the double crossover at MP 333 2 The line-up information explains why the roadmaster said that he believed that train 6 had been crossed over at the crossover at MP 333 2

Track warrant 812, issued at 0452 on the day of the accident to Extra 7200 East, authorized it to " proceed from MP 391 to Chariton on the eastward track with track bulletins in effect 1112, 1116, 1118 " This track warrant did not authorize the train to occupy the eastward track east of the Chariton crossover Track warrant 821 issued to Extra 7200 East at 0821 on the day of the accident authorized the train to " proceed from the crossover Chariton to CTC Halpin on westward track protection as prescribed by rule 99 not required " This track warrant did not authorize the train to occupy the westward track west of the Chariton crossover (See appendix D)

Extra 7200 East, a cabooseless coal train about 1 mile long, went beyond the authorized limits specified in its track warrant and entered into the next ABS track block east of Chariton before its rear end cleared the crossover and before beginning its reverse move Because of its length, the reverse move resulted in the rear of the train traveling across an at-grade crossing that was protected with gates and flashing lights, and then entering the ABS track block west of Chariton Even if the dispatcher had authorized the train to occupy the westward track west of the crossover, which he did not do, there was no one at the rear of the train to notify the engineer of conditions that could affect the movement of the train, such as the signal aspect displayed for the ABS track block west of Chariton and the inability to warn vehicles approaching the at-grade crossing This is an unsafe and dangerous practice The Safety Board is concerned that this procedure jeopardizes the safe movement of trains on the Chicago Region and this crossover procedure demonstrates that BN management should revise its operating practices for reverse moves of cabooseless trains to ensure that this procedure is accomplished safely

Track warrants 822 and 829 issued to train 6 also did not provide for train 6 to occupy the eastward track east of the Chariton crossover or to occupy the westward track west of the Chariton crossover The division superintendent assumed that track warrants protected the trains by permitting them to make the crossover move and operate between specified mileposts This assumption was not supported by the track warrants issued for the movements of train 6 or Extra 7200 East at Chariton The Safety Board believes that this crossover move was made without either train having the proper authority

The track work for relaying curve worn rail on the eastward main track east of Russell was listed on Track Bulletin Form B No 1116 on line 3 for both tracks Since the track work involved the removal and replacement of rail on the eastward track, that track should have been taken out of service and a Form B issued for train movements on the westward track The Form B, however, did not show what work was being performed, or on which track In addition, the dispatcher stated that he was not made aware of the reasons for a Form B order Since the dispatcher was not aware of the type of work or which track was actually affected, he would have no way of knowing which track to use if he were required to route a train around another train on the westward track The Safety Board believes that BN management should have a policy of informing dispatchers of work that affects the movement of trains

Medical and Toxicological Factors

The Safety Board's investigation disclosed no evidence that adverse medical history, chronic or acute ailments, or other illnesses affected the performance of the Amtrak locomotive crew or the BN maintenance-of-way foreman and crane operator Each reported that he was in good health at the time of the accident Amtrak and BN medical files established that all persons involved had been medically examined and certified for the duties they were performing

The maintenance-of-way employees acknowledged receipt of the BN Rules of the Maintenance-of-Way Form 15125, which governs Engineering and Maintenance-of-Way employees of the BN and

also stipulates that these employees are governed by the BN Safety Rules and General Rules, Form 15001 The rules, policies, and procedures as they apply for control of drug and alcohol use of railroad employees are covered in these rule books and any changes or additions are covered in the Special Instructions of the Timetable The application of these rules provides for the testing of all employees governed by the rules

Because the track laborer refused to answer questions concerning his medical condition at the time of the accident, Safety Board investigators could not determine the role his general health may or may not have played in his failure to realign the west stub track switch to its normal position

Analyses of toxicological specimens obtained from the locomotive crewmembers were obtained more than 4 to 5 hours after the accident, no drugs or alcohol were present in the samples The Safety Board believes that to positively determine the use of alcohol, specimens should be taken in a more timely manner The specimens taken from the track maintenance employees 3 hours after the accident also showed that no alcohol or drugs were present with the exception of the BN track laborer, whose blood and urine specimens were found to contain the carboxylic acid metabolite of delta-9-tetrahydrocannabinol (marijuana) Despite the complex pharmacokinetics of marijuana, some conclusions can be made regarding the use of marijuana by the track laborer The level at which the metabolite was detected in the blood and urine, 4 8 and 4 0 ng/ml, respectively, is not indicative of impairment, but is evidence of marijuana use at some previous indeterminate time, since this metabolite may be present for days in the blood, and for weeks in the urine Therefore, the Safety Board concludes that the track laborer probably was not impaired by marijuana at the time of the accident

The Safety Board, nonetheless, is concerned about the potential involvement of drugs in all railroad operations In this case, BN "Rule G" and policy for testing was more comprehensive than the Federal requirements, in that it required testing of employees when they are " involved in an accident or incident and a supervisor has reasonable suspicion to believe that the employee's acts or omissions contributed to the occurrence " This rule included maintenance-of-way employees [17] The BN policy facilitated toxicological sampling of the track laborer, which indirectly led to the finding that he had used marijuana The Safety Board believes that the circumstances of this accident demonstrate the need for a Federal postaccident toxicological testing requirement for maintenance-of-way employees in safety-sensitive positions that can affect the movement of trains These safety sensitive positions include supervisors and managers, maintenance-of-way and maintenance-of-equipment employees, clerks who record hazardous material trains, and employees who maintain locomotive and railroad equipment Recommendations regarding the FRA's alcohol and drug abuse regulations for safety-sensitive positions have been addressed in a Safety Board study on alcohol/drug use and its impact on railroad safety [18]

Survival Factors

The passengers' first indication of the impending accident was the emergency application of the train's brakes Some passengers were thrown into the seat or interior surface in front of them, causing secondary impact injuries For other passengers, the application of the brakes may have served as a warning, giving them the time to brace themselves

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[17] "Supervisor's Handbook of FRA Regulations, BN Policy and Procedures, Concerning the Control of Drug and Alcohol Use in Railroad Operations" - Subpart D - Authorization to Test for Cause

[18] For more information, read Safety Study - *Alcohol/Drug Use and Its Impact on Railroad Safety* (NTSB/SS-88/04)

Several passengers in cars near the front of the train reported being injured when they were thrown from side to side This may have occurred as these cars passed through the turnout, indicating that these cars had not derailed before reaching the turnout

None of the impact forces reported in the derailment were severe Passengers described them as " jolts ," "a lurch," and " as if the brakes were applied several times, very hard " Passengers reported that after realizing that the brakes were being applied, they heard sounds that " were like cars bumping into one another, then there was an abrupt stop and a loud 'boom' " The sound of cars bumping into one another was probably just that Passengers generally described the final impact as the most severe "A very sudden stop," and "a sharp jolt" were some of the descriptions used A passenger in the second car from the rear of the train told investigators about the abrupt stop, which may be attributed to the train impacting the standing work equipment Most injuries, especially the more serious ones, were probably sustained during this impact All passengers who could recall how they were injured reported that the injuries were caused by secondary impacts with interior surfaces or furnishings or with other passengers

In light of the fact that many of the injuries were caused by impact with interior surfaces, the Safety Board noted that in this accident, as in other accidents, seatback cushions became dislodged when struck from the rear, exposing the sheet metal headrest support Following its investigation of the accident in New York City on July 23, 1984, the Safety Board recommended that Amtrak

R-85-81

Modify the coach seats used in Amfleet equipment so that seatback cushions cannot become dislodged when struck and expose surfaces which can cause injuries in accidents

On November 4, 1985, Amtrak responded that it had initiated a program to satisfy the recommendation and as of that date had completed 125 cars Although the Safety Board's then ongoing investigation of the Essex Junction, Vermont,[19] accident on July 7, 1984, revealed a similar problem with the seatbacks of Heritage-class coaches, the program outlined by Amtrak for its Amfleet equipment indicated that the intent of Safety Recommendation R-85-81 was being met, and the recommendation was placed in a "Closed--Acceptable Action" status

To ensure that Amtrak would follow up on the problem with the Heritage-class coaches, the Safety Board, as a result of its completed investigation of the Essex Junction accident, recommended on January 15, 1986, that Amtrak

R-85-127

Redesign and modify the coach and seatback cushions in the Heritage-class coaches to prevent their becoming dislodged when they are impacted from behind

Amtrak responded on September 22, 1987, that it had developed a modification to the seatback cushion, which is currently being made during the car's heavy overhaul or when cushions are renewed Eleven cars had been completed as of the date of the response Due to normal maintenance cycles, Amtrak expected full change-over to take 6 years

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[19]Railroad Accident Report--*Derailment of Amtrak Passenger Train No 60, the Montrealer, on the Central Vermont Railway near Essex Junction, Vermont, July 7, 1984* (NTSB/RAR-85/14)

On April 19, 1988, Amtrak informed the Safety Board that it had reviewed its installation schedule and shortened it to 4 years Based on this projected timeframe, Safety Recommendation R-85-127 is being held in an "Open--Acceptable Action" status

While the Safety Board is pleased that Amtrak is progressing with the modifications to the original type seatback cushions in the Amfleet cars covered in Safety Recommendation R-85-81, these same type seats had been installed not only in the Heritage-class cars covered in Safety Recommendation R-85-127 but also in Superliner coaches that were involved in this accident The Safety Board believes that Amtrak should take steps to redesign and modify the Superliner coach seats

Another problem that may have contributed to passengers impacting with interior surfaces was the failure of seatlocking mechanisms, which causes undesired rotation of the seats, thus allowing the passengers to be ejected from their seats As a result of an accident on April 20, 1979, at Edison, New Jersey,[20] the Safety Board recommended that Amtrak

R-79-72

Require that the seats of all Amfleet equipment are maintained in proper condition to insure that the seats are locked securely in place

Amtrak responded that it had designed and developed an anti-rotating device and had tested a prototype for production

As a result of its investigation of an accident at Dobbs Ferry, New York, on November 7, 1980,[21] the Safety Board issued another recommendation to Amtrak for seatlocking devices

R-81-58

Install an adequate locking device on rotating seats which will prevent undesired rotation in accidents

Amtrak responded on August 3, 1981, that it was progressing with the installation of anti-rotational devices on seats on the Amfleet and Superliner cars during normal maintenance inspections and overhauls On June 22, 1982, Amtrak responded that " Superliners are equipped with anti-rotational locks " In spite of these statements by Amtrak, Safety Board accident investigations continued to reveal that inadequately secured seats remained a problem In its report of the investigation of a 1983 Amtrak derailment at Wilmington, Illinois,[22] the Safety Board recommended that Amtrak

R-84-40

Correct the identified design deficiencies in the interior features of existing and new passenger cars, which can cause injuries in accidents, including the baggage

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[20]Railroad Accident Report--*National Railroad Passenger Corporation (Amtrak) Head End Collision of Train No 111 and Plasser Track Machine Equipment, Edison, New Jersey, April 20, 1979* (NTSB/RAR-79/10)

[21]Railroad Accident Report--*Head End Collision of Amtrak Passenger Train No 74 and Conrail Train OPSE-7 Dobbs Ferry, New York, November 7, 1980* (NTSB/RAR-81/04)

[22]Railroad/Highway Accident Report--*Collision of Amtrak Passenger Train No 301 on Illinois Central Gulf Railroad with MMS Terminals, Inc , Delivery Truck, Wilmington, Illinois, July 28, 1983* (NTSB/RHR-84/02)

retention capabilities of overhead luggage racks, inadequately secured seats, and inadequately secured equipment in food service cars

The recommendation was reiterated to Amtrak when similar problems were encountered as a result of the Safety Board's investigation of an Amtrak derailment at Woodlawn, Texas[23] on November 12, 1983 On March 13, 1985, in response to Safety Recommendation R-84-40, Amtrak reported that as its coaches were overhauled, the locking devices intended to prevent seat rotation would be modified to include a positive locking feature that would prevent undesired rotation Additionally, Amtrak reported that it was replacing complete car sets of seatframes with a design equipped with a step latch with a positive locking device that prevents the seat from falling away from the coach wall, as well as undesired seat rotation Amtrak further reported that it would equip all newly constructed coaches with the improved seatframes As for unsecured equipment in food service cars, Amtrak advised that it would enhance securement of microwave and convection ovens by adding an extra steel bar across the top of the ovens to prevent displacement under extreme shock The modification was being implemented as food service cars undergo overhaul and 120-day maintenance programs Based on this information and the Board's investigation of the Amtrak derailment at Kittrell, North Carolina,[24] on March 5, 1984, which suggested that there had been some efforts to improve seatbacks and seatframes to prevent failures, Safety Recommendations R-79-72 and R-81-58 were ultimately placed in a "Closed--Acceptable Action" status However, inasmuch as Amtrak at the time did not plan to retrofit the overhead luggage racks in its existing cars with retention devices, Safety Recommendation R-84-40 was ultimately placed in a "Closed--Unacceptable Action/Superseded" status, and a new recommendation, as discussed later, was issued in the Essex Junction report specifically addressing luggage retention devices

In response to questions asked during the Safety Board's deposition proceedings following the Russell accident, Amtrak stated that the seatlocks developed in early 1981 and installed on 21 Amfleet cars and 34 of the original Metroliner cars were determined to be unsatisfactory Another supplier developed a positive seatlocking device that was specified on Amfleet II cars delivered through 1983 In addition, seats with the new seatlocking device were purchased from the same supplier to replace deteriorated seats in the Amfleet I cars These additions began in late 1984 during the 6-year overhaul program On March 4, 1988, Amtrak tested a similar positive seatlocking mechanism for installation on the remainder of its passenger car fleet According to Amtrak as of April 1, 1988, no Superliner cars had been equipped with a positive seatlocking device and only 40 percent of the fleet had been so equipped since late 1984 The Safety Board believes that Amtrak should expedite the installation of positive seatlocking devices to achieve its anticipated completion date of September 30, 1989

In addition to the problems of seatback cushions and seat locking devices, the Safety Board is concerned about two other problems that could have caused passenger injuries in this accident The first problem is luggage being ejected from the overhead luggage racks While no passengers reported being struck by luggage, four passengers did see luggage ejected from the racks Although no injuries can be attributed to ejected luggage in this accident, such injuries could occur in the future Luggage was ejected in this accident, just as the Safety Board has reported in numerous Amtrak accidents over many years

The Safety Board has expressed concern to the FRA regarding the inadequacy of effective luggage retention devices in railroad passenger cars As a result of its investigation of the collision of

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[23]Railroad Accident Report--*Derailment of Amtrak Train No 21 (The Eagle) on the Missouri Pacific Railroad, Woodlawn, Texas, November 12, 1983* (NTSB/RAR-85/01)

[24]Railroad Accident Report--*Derailment of Amtrak Train No 81, The Silver Star, on the Seaboard System Railroad, Kittrell, North Carolina, March 5, 1984* (NTSB/RAR-85/03)

an Amtrak passenger train with a delivery truck at Wilmington, Illinois, on July 28, 1983, the Board recommended that the FRA

> R-84-46
>
> Expedite the studies on the interior design of passenger cars, described in the January 1984 Report to Congress, and publish recommended guidelines for securing seats and for luggage retention devices

The recommendation was reiterated to the FRA following the Safety Board's investigation of the rear-end collision between a Boston and Maine Corporation commuter train and a Consolidated Rail Corporation freight train near Brighton, Massachusetts, on May 7, 1986,[25] and following the Board's investigation of the rear-end collision of Amtrak passenger train 94 and a Conrail freight train at Chase, Maryland, on January 4, 1987 [26]

Following the Safety Board's investigation of the accident at Essex Junction, in which overhead luggage falling from the racks was documented as a common cause of injuries, the Board addressed the following recommendation to Amtrak, in part because it appeared the FRA was reluctant to take any action on this issue as evidenced by its unresponsiveness to Safety Recommendation R-84-46

> R-85-128
>
> Develop and install effective retention devices in its overhead luggage racks to prevent the dislodging of luggage and other articles in a collision and/or derailment

On September 22, 1987, Amtrak informed the Safety Board that " test luggage restraints have been installed on three car sets Luggage restraints have been approved by Federal agencies We estimate installation will take 6 years to complete " The Board noted during a visit to an Amtrak facility in October 1986 that the test restraint devices had some sharp protruding edges that could become an additional source of injuries, particularly if a car overturned

On April 19, 1988, Amtrak responded to the Safety Board that.

> Amtrak has modified the design of its luggage retention devices to eliminate the sharp edges Our investigations revealed that luggage moved longitudinally during derailments, then piled up and spilled into the car body By having the vertical stops on 81-inch centers and a raised side rail, the luggage will be successfully restrained With regard to the approval of this modification, there is no formal review process for such modifications Arrangements were made for representatives of both the NTSB and FRA to review and attend a field test of the new system

Amtrak's schedule shows that 22 cars of a scheduled 991 cars have had the modified luggage retention device installed as of the date of the response and that completion will vary from 1989 to 1991 depending on the car type

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[25]Railroad Accident Report--*Rear-End Collision Between Boston and Maine Corporation Commuter Train No 5324 and Consolidated Train TV-14, near Brighton, Massachusetts, May 7, 1986* (NTSB/RAR-87/02)

[26]Railroad Accident Report--*Rear-End Collision of Amtrak Train 94, the Colonial, and Consolidated Rail Corporation Freight Train ENS-121 on the Northeast Corridor near Chase, Maryland, January 4, 1987* (NTSB/RAR-88/01)

Although the test restraint devices appear to prevent the longitudinal movement of luggage and Amtrak has eliminated some of the sharp protruding edges, the full effectiveness of the devices has not been evaluated in a testing situation for an overturned car Despite these concerns, the Safety Board continues to believe that once an adequate device has been evaluated and determined suitable, installation should be accomplished as expeditiously as possible in view of the fact that passenger injuries continue to occur as a result of luggage falling from the overhead luggage racks Moreover, the Board is concerned with the FRA's most recent response to Safety Recommendation R-84-46, dated March 16, 1988, in that the FRA has endorsed Amtrak's current retrofit program, even though adequate testing and evaluation of the devices has not been done The Board has urged the FRA to look into all possible solutions to the luggage retention problem and develop guidelines that would apply to any carrier involved in passenger rail service Safety Recommendations R-84-46 and R-85-128 are currently held in an "Open--Unacceptable Action" status

A second problem affecting passenger safety was televisions, coffeemakers, and microwave ovens in the lounge car that were not equipped with restraints It was noted in this accident that the televisions in the lounge car were broken from their mounts and lying on the floor While it could not be determined if the televisions caused any injuries, it is a very real possibility Unsecured coffee makers were also found on the floor and unsecured ovens were found in their mounts, but loose As the Safety Board noted in previous investigations, Amtrak is making progress in securing equipment in food service cars The Safety Board urges Amtrak to expedite the program, and to include in that program all equipment that is either unsecured or inadequately secured

In addition to the survival factors affecting passenger safety, the Safety Board is concerned that locomotive crashworthiness continues to be a problem affecting the safety of traincrews In this accident, the derailment and overturning of the locomotive could have resulted in more serious injuries, and possibly fatalities, had the locomotive compartment become filled with dirt and ballast The forced opening of the cab compartment door and displacement of a side window, all of which were on the fireman's side when the lead unit overturned and derailed, were similar to the damage observed by the Safety Board in another accident In the investigation of an Amtrak passenger train derailment at Fall River, Wisconsin, on October 9, 1986,[27] the Safety Board determined that, when the locomotive derailed and overturned, the compartment was filled with rain-soaked dirt that entered through the window and the cab of the locomotive when the door opened As a result, the fireman was asphyxiated The Safety Board has long been concerned that locomotive crashworthiness should be improved to protect locomotive crewmembers This concern led the Safety Board to issue recommendations to the FRA, the most recent being on September 9, 1987, following the Union Pacific train accident at North Platte, Nebraska [28]

R-87-23

Promptly require locomotive operating compartments to be designed to provide crash protection for occupants of locomotive cabs

In its response to Safety Recommendation R-87-23, dated April 20, 1988, the FRA, in summary, indicated that (1) the FRA has recognized that both American locomotive manufacturers would be considering major design modifications to their products in the late 1980s It has been the FRA's objective to promote an agreement between the two manufacturers to include a series of design improvements in the cabs of their new basic models, (2) the FRA Locomotive Control Compartment

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[27]Railroad Accident Report--*Derailment of Amtrak Passenger Train 8 Operating on the Soo Line Railroad, Fall River, Wisconsin, October 9, 1986* (NTSB/RAR-87/06)

[28]Railroad Accident Report--*Rear-End Collis on and Derailment of Two Union Pacific Freight Trains Near North Platte, Nebraska, July 10, 1986* (NTSB/RAR-87/03)

Committee (LCCC) has proposed a list of specific design improvements that may be achievable soon, (3) the FRA tentatively intends to schedule hearings on this issue during September and October of 1988 (See appendix J) The Safety Board recognizes that an agreement between the two manufacturers would be desirable However, in view of the fact that no agreement has been made over the many years, the Board questions the ability of the FRA to accomplish this objective without regulatory action Further, while the Board also agrees that the proposals of the LCCC are desirable, these proposals do not address the issue of cab crashworthiness Moreover, the Board questions the need to study this issue further through a special safety inquiry

The Safety Board reiterates its position that the FRA should promptly require locomotive operating compartments to be designed to provide crash protection for occupants of locomotive control compartments In the meantime, Safety Recommendation R-87-23 is being held in an "Open--Unacceptable Action" status

Emergency Response

The notification of and response by the several agencies that participated was timely and effective The response of the first units was rapid, and upon arrival, they did not delay in calling for additional help Because of the sparse population in the Russell area, it was necessary to rely on emergency equipment from Chariton and as far away as Des Moines, about 100 miles away The on-site incident commander handled the coordination of the responding units well

The triage and transport of the injured was also handled well The most seriously injured were transported most expeditiously, by helicopter, to the hospitals best able to treat them Emergency personnel took the remainder of the injured to the local hospital in Chariton after considering such factors as the types of injuries and their severity, the hospital's ability to handle a given number of emergency cases, and the availability of long-term care

All phases of the emergency operations were carried out smoothly and efficiently at all levels This observation was corroborated by passengers who praised all elements of the rescue operation and the people who performed them

CONCLUSIONS

Findings

1 The signal system was not a causal factor in the accident (The train was operating against the current of traffic without signal protection)

2 Track conditions were not a causal factor in the accident

3 The switch banner was ineffective in providing warning to the engineer in time to stop or significantly slow the train

4 The Amtrak crew was experienced in the operation of the train, although they had not met the BN requirements for the operating rules and physical characteristics of the division

5 The engineers of Extra 7200 East and Amtrak train 6 operated their trains in accordance with the train orders that had been issued for the crossover movement at Chariton

6 The red flag was a prescribed signal at a designated location to indicate conditions affecting the movement of a train

7 The Form B creates a double standard in that it allows the track foreman to authorize a train to operate past a red flag without stopping and to proceed through a work area at speeds greater than restricted speed, however, the train dispatcher cannot authorize a train to operate past a red signal without the train stopping and then proceeding at restricted speed to the next signal

8 Had train 6 been required to stop at the red flag which was a fixed signal, the train could only have proceeded at restricted speed through the limits of the work area and the accident probably would have been avoided

9 Had the track foreman selected the restricted speed option of Form B, train 6 would have been authorized to operate through the limits of the work area at restricted speed and the engineer would have had time to stop his train when he saw that the switch was improperly lined

10 The track laborer failed to return the west stub track switch to its normal position

11 The track foreman failed to check the alignment of the west stub track switch

12 The crane operator failed in his responsibility to prevent equipment from entering the track on which his crane was stored

13 Maintenance-of-way management failed to properly administer effective efficiency testing that would ensure that employees were properly tested on the correct application of the rules and that the rules were adequately tested

14 The procedure used to back trains through the crossover at Chariton was an unsafe operating practice

15 The track laborer had used marijuana at some time before the accident, but probably was not impaired at the time of the accident

16 Amtrak has made inadequate progress in correcting previously identified interior safety problems of passenger cars

17 The emergency response was done in a timely and professional manner

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the track laborer to restore the stub track switch for the mainline track, the failure of the crane operator and track foreman to check the position of the stub track switch, and the failure of the operating management of Burlington Northern to restrict the speed of trains through a work area and to check the condition of the switch banner

RECOMMENDATIONS

As a result of its investigation, the Safety Board made the following recommendations

--to the Burlington Northern Railroad Company

Eliminate the practice of using Form B track bulletins that authorize a speed greater than restricted speed through work areas (Class II, Priority Action) (R-88-40)

Enhance the conspicuity of switch banners on manually operated switches on mainline trackage (Class II, Priority Action) (R-88-41)

Establish a recurrent rules training program with a valid testing procedure for maintenance-of-way employees (Class II, Priority Action) (R-88-42)

Develop an effective efficiency testing program for maintenance-of-way employees (Class II, Priority Action) (R-88-43)

Revise the operating practices for reverse movements of cabooseless trains to ensure that the procedure is accomplished safely (Class II, Priority Action) (R-88-44)

Establish a procedure to provide information to train dispatchers regarding track work affecting train movements (Class II, Priority Action) (R- 88-45)

--to the National Railroad Passenger Corporation (Amtrak)

Redesign and modify the coach and seatback cushions in the Superliner-class coaches to prevent their becoming dislodged when they are impacted from behind (Class II, Priority Action) (R-88-46)

Develop and install effective retention devices for televisions sets in all passenger cars to prevent them from becoming dislodged in an accident (Class II, Priority Action) (R-88-47)

Develop and install effective retention devices for coffeemakers in all passenger cars to prevent them from becoming dislodged in an accident (Class II, Priority Action) (R-88-48)

--to the American Short Line Railroad Association and the Association of American Railroads

Inform your membership of the circumstances of the train accident at Russell, Iowa, on October 12, 1987 (Class II, Priority Action) (R-88-49)

--to the Union Pacific System, Missouri-Kansas-Texas Railroad System, St Louis Southwestern Railway Company, Southern Pacific Transportation Company, Atchison, Topeka, and Santa Fe Railway Company, Chicago and North Western Transportation Company, Davenport, Rock Island and North Western Railway Company, Lake Superior and Ishpeming Railroad Company, Minnesota Transfer Railway Company, and Soo Line Railroad Company

Eliminate the practice of using Form B track bulletins that authorize a speed greater than restricted speed through work areas (Class II, Priority Action) (R-88-50)

In addition to these recommendations, the Safety Board reiterated the following Safety Rcommendations, which had been issued previously to the Federal Railroad Administration

> Expedite the studies on the interior design of passenger cars, described in the January 1984 Report to Congress, and publish recommended guidelines for securing seats and for luggage retention devices (R-84-46)
>
> Promptly require locomotive operating compartments to be designed to provide crash protection for occupants of locomotive cabs (R-87-23)

The Safety Board also reiterated the following Safety Recommendation to Amtrak

> Develop and install effective retention devices in its overhead luggage racks to prevent the dislodging of luggage and other articles in a collision and/or derailment (R-85-128)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ JAMES L. KOLSTAD
Vice Chairman

/s/ JOHN K. LAUBER
Member

/s/ JOSEPH T. NALL
Member

/s/ LEMOINE V. DICKINSON, JR.
Member

July 19, 1988

APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

Investigation

The National Transportation Safety Board was notified of this accident at 1 p m on October 12, 1987, and immediately dispatched investigators from its Atlanta and Chicago Field Offices The investigator-in-charge and other members of the investigative team were dispatched to the scene from Washington, D C Individual investigative groups were established for operations, human performance, survival factors, mechanical, and track

Hearing

The Safety Board staff conducted a deposition proceeding as part of its investigation of this accident on January 26 and 27, 1988, at Ottumwa, Iowa Parties to this proceeding included the Burlington Northern Railroad, National Railroad Passenger Corporation, Brotherhood of Maintenance of Way Employees, and the Federal Railroad Administration Twelve witnesses testified

APPENDIX B

PERSONNEL INFORMATION

Track Foreman, John D. Horn

Track foreman John D Horn, 34, was employed as a section laborer in October 1974 by the Burlington Northern Railroad He had served as a laborer, equipment operator, track inspector and in 1977 became a foreman

Laborer, Timothy W. Sundquist

Laborer Timothy W Sundquist, 41, was employed as a section laborer in 1973 by the Burlington Northern Railroad

Crane Operator, Ray E. Bartlett

Crane operator Ray E Barlett, 40, was employed as a section laborer in 1977 He has been an equipment operator in the Chicago Region since 1978

Engineer, James C. Salmon

Engineer James C Salmon, 50, had been employed by the Illinois Central Gulf Railroad in August 1961 and had 14 years of passenger train experience He was promoted to engineer in February 1967 and in March 1987 he was employed by Amtrak as an engineer

Pilot, Robert J. Campbell

Pilot Robert J Campbell, 61, had been employed by the Burlington Northern Railroad in 1943, entered engine service in 1951, and was promoted to engineer in 1958

Fireman, Robin K. Hooker

Fireman Robin K Hooker, 41, had been employed by the Illinois Central Gulf Railroad in 1975 as a brakeman He had served as a brakeman and fireman and was promoted to engineer in 1978 In June 1987 he was employed by Amtrak as a fireman

APPENDIX C

TRACK WARRANT AND TRAIN BULLETINS AT CRESTON, IOWA

TRACK WARRANT 822

TRACK WARRANT — SOUTHERN RAILROAD

No 822 — Oct 12 — 19 87

To: Extra Amtk 396 East and pilot — At: Creston

1 ☐ Track warrant number _____ is void

2 ☒ Proceed from MP 391 To Crossover Chariton Eastward track

3 ☐ Proceed from _____ To _____ On _____ track

4 ☐ Work between _____ And _____ On _____ track

5 ☐ Not in effect until _____ M

6 ☐ This authority expires at _____ M

7 ☐ Not in effect until after arrival of _____ at _____

8 ☐ Hold main track at last named point

9 ☐ Do not foul limits ahead of _____

10 ☐ Clear main track at last named point

11 ☐ Between _____ and _____

make all movements at restricted speed Limits occupied by train or engine

12 ☐ Between _____ and _____

make all movements at restricted speed and stop short of men or machines fouling track

13 ☐ Do not exceed _____ MPH between _____ and _____

14 ☐ Do not exceed _____ MPH between _____ and _____

15 ☐ Protection as prescribed by Rule 99 not required

16 ☒ Track bulletins in effect 1112, 1116, 1118, _____, _____, _____, _____, _____, _____, _____, _____, _____

17 ☐ Other specific instructions _____

OK 0917 M — Dispatcher JSS

Relayed to _____ — Copied by Browning

Limits reported clear at _____ M — By _____

(Mark X in box for each item instructed)

FORM 19974 4-86 — Printed in U. S. A.

TRACK BULLETIN FORM D NO. 1112

BURLINGTON NORTHERN TRACK BULLETIN FORM D

NO. 1112 DATE OCT 8 1987

TO WESTWARD TRAINS AT GALESBURG
TRAINS ORIGINATING AT BURLINGTON AND OTTUMWA AND ALBIA
EASTWARD TRAINS AT CRESTON
YARD ENGINES AT BURLINGTON

PSGR TRAINS DO NOT EXCEED 40 MPH FRT TRAINS 25 MPH ON EASTWARD TRACK AT MP 345

DO NOT EXCEED 25 MPH ON EASTWARD TRACK BETWEEN MP 371 AND MP 370.2

PSGR TRAINS DO NOT EXCEED 60 MPH FRT TRAINS 40 MPH ON EASTWARD TRACK BETWEEN MP 375.8 AND MP 375.6

AT DANVILLE HOUSE TRACK OUT OF SERVICE

AT LOCKRIDGE HOUSE TRACK OUT OF SERVICE

AT RUSSELL EASTWARD STUB OUT OF SERVICE

AT CHARITON EAST LEG OF WYE OUT OF SERVICE

AT FAIRFIELD TRACK SIDE WARNING DETECTOR AT MP 251.6 ON BOTH TRACKS OUT OF SERVICE

AT OSCEOLA TRACK SIDE WARNING DETECTOR AT MP 356.7 OUT OF SERVICE

OK 2200 SJH
END

TRACK BULLETIN FORM B NO. 1116

X02 P42 P42 0021158003
O.T.H. K220355 ** VIA C@@ - FILE @@ **
K120355 0R20 1800 10/11/87 U013 COPY OF U007
****TASK ZZ G820126 G820126 PKH N013 ZZ

BURLINGTON NORTHERN RAILROAD TRACK BULLETIN FORM B
NO 1116 ON FIRST SUBDIV DATE OCT 11 1987

TO WESTWARD TRAINS AT GALESBURG
TRAINS ORIGINATING AT BURLINGTON AND OTTUMWA AND ALBIA
EASTWARD TRAINS AT CRESTON

ON OCT 12 1987
BE GOVERNED BY RULE 455 WITHIN THE FOLLOWING LIMITS

LINE	LIMITS		TIME			FOREMAN	
VOID/NO	MP	TO MP	FROM	UNTIL	TRACKS	OR GANG NO	STOP
1.	257.6	264.2	0700	1600	BOTH	W J WILSON	
2.	266	263	0801	1530	EASTWARD	D C ROBERTS	
3	321	323.7	0630	1801	BOTH	P K MINNIS	
4.	325	327.8	0801	1300	BOTH	J D HORN	

OK 1756 DISPATCHER PKH RELAYED TO
END

TRACK BULLETIN FORM B NO. 1118

X01 P42 P42 223651B003
D.T.H. K120355 ** VIA CQB - FILE QQ **
K120355 0020 1823 10/11/87 U013
****TASK ZZ G820126 G820126 PKH N028 ZZ

BURLINGTON NORTHERN RAILROAD TRACK BULLETIN FORM B
NO 1118 ON FIRST SUBDIV DATE OCT 11 1987

TO WESTWARD TRAINS AT GALESBURG
TRAINS ORIGINATING AT BURLINGTON AND OTTUMWA AND ALBIA
EASTWARD TRAINS AT CRESTON

ON OCT 12 1987
BE GOVERNED BY RULE 455 WITHIN THE FOLLOWING LIMITS

LINE VOID/NO	LIMITS MP	TO MP	TIME FROM	UNTIL	TRACKS	FOREMAN OR GANG NO	STOP
1.	382.7	388	0730	1430	BOTH	R L MEYERS	
2.							
3.							
4.							

OK 1822 DISPATCHER PKH RELAYED TO
END

APPENDIX D

TRACK WARRANTS AT OSCEOLA, IOWA

TRACK WARRANT 829

~~TRACK~~ WARRANT — BURLINGTON NORTHERN RAILROAD

830 12 56

No 829 Oct. 12 19 87

To: Amtrak 396 East At: Osceola

1 ☐ Track warrant number _____ is void

2 ☒ Proceed from Crossover #1 Siemens To CTC Hdqs On Eastward track

3 ☐ Proceed from _____ To _____ On _____ track

4 ☐ Work between _____ And _____ On _____ track

5 ☐ Not in effect until _____ M

6 ☐ This authority expires at _____ M

7 ☐ Not in effect until after arrival of _____ at _____

8 ☐ Hold main track at last named point

9 ☐ Do not foul limits ahead of _____

10 ☐ Clear main track at last named point

11 ☐ Between _____ and _____

make all movements at restricted speed Limits occupied by train or engine

12 ☐ Between _____ and _____

make all movements at restricted speed and stop short of men or machines fouling track

13 ☐ Do not exceed _____ MPH between _____ and _____

14 ☐ Do not exceed _____ MPH between _____ and _____

15 ☐ Protection as prescribed by Rule 99 not required

16 ☐ Track bulletins in effect _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____

17 ☐ Other specific instructions: _____

OK 1058 M Dispatcher TSS

Relayed to _____ Copied by _____

Limits reported clear at _____ M By _____

(Mark X in box for each item instructed)

FORM 15874 4-88 Printed in U. S. A.

APPENDIX D

TRACK WARRANT 830

TRACK WARRANT — BURLINGTON NORTHERN RAILROAD

No 830 Oct. 12 19 87

To 396 East At Osceola

1 ☐ Track warrant number _____ is void

2 ☑ Proceed from CTC Maxol To MP 168-4 On Eastward track

3 ☐ Proceed from _____ To _____ On _____ track

4 ☐ Work between _____ And _____ On _____ track

5 ☐ Not in effect until _____ M

6 ☐ This authority expires at _____ M

7 ☐ Not in effect until after arrival of _____ at _____

8 ☐ Hold main track at last named point

9 ☐ Do not foul limits ahead of _____

10 ☐ Clear main track at last named point

11 ☐ Between _____ and _____

make all movements at restricted speed Limits occupied by train or engine

12 ☐ Between _____ and _____

make all movements at restricted speed and stop short of men or machines fouling track

13 ☐ Do not exceed _____ MPH between _____ and _____

14 ☐ Do not exceed _____ MPH between _____ and _____

15 ☐ Protection as prescribed by Rule 99 not required

16 ☐ Track bulletins in effect _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____

17 ☐ Other specific instructions _____

OK 1100 M Dispatcher JJS

Relayed to _____ Copied by _____

Limits reported clear at _____ M By _____

(Mark X in box for each item instructed.)

FORM 15874 4-86 Printed in U S A.

APPENDIX D

TRACK WARRANT 812

TRACK WARRANT BURLINGTON NORTHERN RAILROAD

No 812 MONDAY OCT 12 1987 19

To: Extra 7200 East At: Creston

1 ☐ Track warrant number _____ is void.

2 ☒ Proceed from MP 391 To Chariton On Eastward track

3 ☐ Proceed from _____ To _____ On _____ track.

4. ☐ Work between _____ And _____ On _____ track

5 ☐ Not in effect until _____ M

6 ☐ This authority expires at _____ M.

7 ☐ Not in effect until after arrival of _____ at _____

8. ☐ Hold main track at last named point

9 ☐ Do not foul limits ahead of _____

10 ☐ Clear main track at last named point

11 ☐ Between _____ and _____

make all movements at restricted speed Limits occupied by train or engine

12 ☐ Between _____ and _____

make all movements at restricted speed and stop short of men or machines fouling track

13 ☐ Do not exceed _____ MPH between _____ and _____.

14. ☐ Do not exceed _____ MPH between _____ and _____

15 ☐ Protection as prescribed by Rule 99 not required

16 ☒ Track bulletins in effect 1112, 1114, 1118, _____, _____,

_____, _____, _____, _____, _____, _____, _____

17 ☐ Other specific instructions: _____

OK 0952 M Dispatcher MEL

Relayed to _____ Copied by R Helton

Limits reported clear at 0908 M By Dodson

(Mark X in box for each item instructed.)

A 15673 4-86 Printed in U. S. A.

APPENDIX D

TRACK WARRANT 821

TRACK WARRANT BURLINGTON NORTHERN RAILROAD

No 821 MONDAY OCT 12 1987 19

To EXTRA 7200 EAST At: MP543

1 ☐ Track warrant number _____ is void

2. ☒ Proceed from CROSSOVER CARLTON To CC HARPER On WESTWARD track

3 ☐ Proceed from _____ To _____ On _____ track

4 ☐ Work between _____ And _____ On _____ track

5 ☐ Not in effect until _____ M

6 ☐ This authority expires at _____ M

7 ☐ Not in effect until after arrival of _____ at _____

8 ☐ Hold main track at last named point

9 ☐ Do not foul limits ahead of _____

10 ☐ Clear main track at last named point

11 ☐ Between _____ and _____

make all movements at restricted speed Limits occupied by train or engine

12 ☐ Between _____ and _____

make all movements at restricted speed and stop short of men or machines fouling track

13 ☐ Do not exceed _____ MPH between _____ and _____

14 ☐ Do not exceed _____ MPH between _____ and _____

15. ☒ Protection as prescribed by Rule 99 not required.

16 ☐ Track bulletins in effect _____, _____, _____, _____, _____,

_____, _____, _____, _____, _____, _____, _____

17 ☐ Other specific instructions _____

OK 0821 M Dispatcher JS

Relayed to _____ Copied by DOBSON

Limits reported clear at 0459 M By DOBSON

(Mark X in box for each item instructed.)

FORM 15973 4-86 Printed in U S A

APPENDIX E

EXCERPTS FROM BURLINGTON NORTHERN RAILROAD RULES OF THE MAINTENANCE OF WAY FORM 15125 EFFECTIVE APRIL 27, 1986

GENERAL NOTICE

These rules govern Engineering and Maintenance of Way employes of Burlington Northern Railroad Company and affiliated lines, and any employe to whom a copy is furnished They must be complied with by all employes regardless of gender whose duties are in any way affected thereby Employes are also governed by Burlington Northern Railroad Safety Rules and General Rules book, Form 15001

These rules take effect April 27, 1986, superseding all rules and instructions inconsistent therewith

Special instructions may be issued by the proper authority

* * *

Fixed Signal
A signal of fixed location indicating a condition affecting the movement of a train

* * *

B Employes whose duties are prescribed by these rules must have a copy available for reference while on duty

Employes whose duties are affected by the timetable and/or special instructions must have a current copy immediately available for reference while on duty

Employes must be familiar with and obey all rules and instructions, and must attend required classes

If in doubt as to the meaining of any rule or instruction, employes must apply to their supervisor for an explanation

Rules or instructions may be issued, cancelled or modified by general order, timetable, special instructions or superintendent's notice

When authorized by superintendent, general orders or special instructions may be cancelled, modified or issued by train order Form Q or track bulletin.

* * *

Restricted Speed
A speed that will permit stopping within one half the range of vision, short of train, engine, railroad car, stop signal, derail or switch not properly lined, looking out for broken rail, not exceeding 20 MPH

* * *

G. Employes must not report for duty, perform service, or enter Company property with a blood alcohol content greater than 0 00 percent and are prohibited from the use, possession or sale of alcoholic beverages while on duty.

Employes must not report for duty, perform service, or enter Company property under the influence of illegal controlled substances and are prohibited from their use, possession or sale while on duty or on Company property For purposes of this rule, any employe testing positive for a controlled substance (or its metabolite) in their urine is presumed to be under the influence of such drugs

Employes must not report for duty or perform service under the influence or impaired by prescription drugs, medications or other substances that may in any way adversely affect their alertness, coordination, reaction, response or safety

Employes operating Company vehicles at any time are subject to this rule

* * *

9. PRESCRIBED SIGNALS: Flags of prescribed color must be used by day, and reflectorized flags of prescribed color and type by night Flags may be cloth, metal or other suitable material

Day signals must be displayed from sunrise to sunset Night signals must be displayed from sunset to sunrise and when day signals cannot be plainly seen

10 TEMPORARY RESTRICTIONS: A yellow flag will be displayed not less than 2 miles, when practicable, in advance of each location where train movement is to be restricted by train order, track bulletin. track warrant or general order due to track conditions, structures, men or equipment Restriction specified by train order, track bulletin, track warrant or general order must be complied with until rear of train has passed green flag or train has cleared limits of the restriction when green flag is not displayed

When yellow flag cannot be placed 2 miles in advance of restriction due to close proximity to a terminal, a junction or for other reasons, the train dispatcher must be informed of actual location of yellow flag Such information must be included in train order, track bulletin, track warrant or general order. Employe requesting train order, track bulletin or track warrant must determine from train dispatcher if green flag will overlap yellow flag

APPENDIX E

When yellow flag is displayed and restriction is not specified by train order, track bulletin, track warrant or general order, speed must be reduced, proceeding prepared to stop short of flagman, red flag, or men and equipment fouling track 2 miles beyond yellow flag and not exceeding 10 MPH. Speed may be resumed only after rear of train has passed:

(1) a green flag, or,

(2) a point 4 miles from the yellow flag and crew has ascertained from the train dispatcher that there is no train order, track bulletin or track warrant restricting movement at that location

EXCEPTION: Contact with train dispatcher will not be required where Rule 10(D) is in effect.

A green flag displayed will indicate the end of the restriction

When a series of locations requiring reduced speeds are so closely spaced that the green flags will overlap the yellow flags, a yellow flag will be placed in advance of each location. Only one green flag will be placed at the leaving end of the last location.

10(A). DISPLAY OF RED FLAG: A red flag will be displayed at locations where trains must stop as required by Form Y train order, track bulletin or due to other conditions

Train must stop short of the red flag and not proceed unless authorized by foreman

If authority to proceed is received before stop is made, train may pass red flag without stopping

If Form Y train order or Form B track bulletin is not in effect, after authority to proceed is received, unless instructions from foreman specifies a different speed or distance, a speed of 10 MPH must not be exceeded until rear of train has passed green flag or has reached a point 2 miles from the red flag

* * *

35. WHEN LINE-UP REQUIRED: Prescribed form must be used for train location information A copy of current line-up must be obtained (except when not required in CTC or TWC) and read to other members of crew under the following conditions:

(1) Before placing on-track equipment on main track,

(2) Before operating any off-track equipment foul of a main track,

(3) Before working on or obstructing a main track.

* * *

40. CLEARING TRAIN TIME: The time of all trains must be cleared no less than ten (10) minutes. If the line-up indicates regular train is running late, the later time will be used Only train location time issued by train dispatcher can be used in clearing trains except, when authorized by the train dispatcher, the location of specified trains may be determined by direct communication with such trains.

In figuring the time of any train between stations the maximum authorized speed for that train will be used and computed according to the following chart

SPEED, DISTANCE, TIME CHART

	SPEED MPH													
	25		35		40		45		49-50		55		60	
Distance Miles	Hr	Min	Hr	Min	Hr	Min	Hr	Min	Hr	Min	Hr	Min	Hr	Min
10	0	24	0	17	0	15	0	13	0	12	0	10	0	10
15	0	36	0	25	0	22	0	19	0	18	0	16	0	15
20	0	48	0	34	0	30	0	26	0	24	0	21	0	20
25	1	00	0	42	0	37	0	33	0	30	0	27	0	25
30	1	12	0	51	0	45	0	40	0	36	0	32	0	30
35	1	24	1	00	0	52	0	46	0	42	0	38	0	35
40	1	36	1	08	1	00	0	53	0	48	0	43	0	40
45	1	48	1	17	1	07	1	00	0	54	0	49	0	45
50	2	00	1	25	1	15	1	06	1	00	0	54	0	50
55	2	12	1	34	1	22	1	13	1	06	1	00	0	55
60	2	24	1	42	1	30	1	19	1	12	1	05	1	00
65	2	36	1	51	1	37	1	26	1	18	1	10	1	05
70	2	48	2	00	1	45	1	33	1	24	1	16	1	10
75	3	00	2	08	1	52	1	40	1	30	1	21	1	15
80	3	12	2	17	2	00	1	46	1	36	1	27	1	20
85	3	24	2	25	2	07	1	53	1	42	1	32	1	25
90	3	36	2	34	2	15	2	00	1	48	1	38	1	30
95	3	48	2	42	2	22	2	06	1	54	1	43	1	35
100	4	00	2	51	2	30	2	13	2	00	1	49	1	40

NOTE Use next smaller mileage when calculating time
Example: If 58 miles use 55 miles

* * *

43. UNABLE TO OBTAIN LINE-UP: When unable to obtain a line-up due to failure in communications or no communication is available, on-track equipment may occupy and move on main track clearing regular trains not less than ten (10) minutes Protection must be provided against all other trains where a clear view is not afforded for a sufficient distance to permit removal of on-track equipment without hazard

* * *

63. ROAD CROSSINGS: In approaching and passing over road crossings, on-track equipment must be handled in the following manner:

(1) Approach crossing under complete control.

(2) Stop if necessary.

* * *

75. MAIN TRACK SWITCHES: Main track hand throw switches must not be opened except for heavily loaded on-track equipment, and then only under the supervision of the employe in charge who will be held responsible for restoring switch to normal position

* * *

APPENDIX E

85. FLAGGING EQUIPMENT: The foreman or operator of on-track equipment or off-track equipment must see that each machine and vehicle is provided with an adequate supply of torpedoes, fusees and other flagging equipment to provide proper protection as prescribed by the rules

Flagman's signals·

Day Signals—A red flag, not less than ten torpedoes and six red fusees

Night Signals—A white light, not less than ten torpedoes and six red fusees

* * *

104(A). POSITION OF SWITCHES: Employes handling switches and derails must see they are properly lined for route to be used It must be seen that points fit properly and that indication of target or lamp, if so equipped, corresponds with position of switch After locking a switch or derail, the lock must be tested to know it is secured

104(B) MAIN TRACK SWITCHES: The normal position of a main track switch is for main track movement and it must be left lined and locked in that position except when changed for the immediate movement

On main track switches so equipped, the target will show red when lined in other than its normal position

* * *

538. INSPECTION OF TRAINS: Employes must observe trains closely and if anything unusual or defective is noted such as a hot journal, brakes sticking, dragging brake rigging, sliding wheels, indications of fire, lading shifted over side or end of car, protruding objects swinging car door or any other dangerous condition, they must make every effort to call the attention of the crew on the train to such conditions If train is moving, stop signal must be given Train dispatcher must be notified at once if unable to stop train

When practicable, and the number of employes will permit, inspection of passing trains should be made from both sides of the train, but keeping clear of other tracks upon which train or other movements may be made

Trackside warning detectors do not relieve employes from making inspections required by rules

* * *

908. PROTECTION: Occupied outfit cars and on-track equipment, when set out, should be protected by a train order or by spiking the switch of track involved.

* * *

455. PROTECTION BY TRACK BULLETIN: During the time and within the limits stated in track bulletin Form B, trains and engines must move at restricted speed and stop short of men or machines fouling track or a red flag placed to the right of the track unless verbally instructed otherwise as prescribed below or entire train has passed a green flag or has cleared the limits

The engineer must attempt to contact employe in charge by radio sufficiently in advance to avoid delay, advising his location and specifying track

In granting verbal authority, the following words will be used:

"Foreman____(name)____(of Gang No _____) using track bulletin No _____ line No _____ between MP_____ and MP_____ on _____ Subdivision "

(a) To authorize train or engine to pass a red flag, or enter limits, without stopping, the following will be added:

"____(train)____may pass red flag located at MP_____(or enter limits) without stopping "

Train or engine may pass red flag, or enter limits, without stopping, continuing to move at restricted speed and must stop short of men or equipment fouling track

(b) To authorize a train or engine to proceed at a speed greater than restricted speed, the following will be added:

"____(train)____ may proceed through the limits at_____ MPH (or at 'maximum authorized speed')."

Train may proceed through the limits at the prescribed speed unless otherwise restricted.

(c) To require train or engine to move at a speed less than restricted speed, the following will be added

"____(train)____proceed at restricted speed but not exceeding_____MPH (adding if necessary 'until reaching MP_____') "

Train must not exceed the prescribed speed and must be prepared to stop short of men or equipment fouling the track or a red flag to the right of the track

These instructions must be repeated by the engineer and "OK" received from employe giving them before they are acted upon.

When the word STOP is written in the Stop column, train or engine must not enter the limits until verbal authority is received from employe in charge as prescribed by example (a) above

Yellow flags must be displayed as prescribed by Rule 10.

APPENDIX F

EXCERPTS FROM BURLINGTON NORTHERN RAILROAD CHICAGO REGION CHICAGO, GALESBURG AND NEBRASKA DIVISIONS TIMETABLE NO. 6 SUNDAY, OCTOBER 26, 1986

AND

BURLINGTON NORTHERN RAILROAD COMPANY SAFETY RULES AND GENERAL RULES FORM 15001 8/31

* * *

12. **Rules of the Maintenance of Way—Rules changes and additions—**

Rule G—change to read:

Employes must not report for duty, perform service, or enter Company property with a blood alcohol content greater than 0 00 percent and are prohibited from the use, possession or sale of alcoholic beverages while on duty or on Company property

Employes must not report for duty, perform service, or enter Company property under the influence of illegal controlled substances and are prohibited from their use, possession or sale while on duty or on Company property For purposes of this rule, any employe testing positive for a controlled substance (or its metabolite) in their urine is presumed to be under the influence of such drugs

Employes must not report for duty or perform service under the influence or impaired by prescription drugs, medications or other substances that may in any way adversely affect their alertness, coordination, reaction, response or safety

Employes operating Company vehicles at any time are subject to this rule

13. **Safety Rules and General Rules—Rules changes and additions—**

* * *

Rule 565—change to read:

Employes must not report for duty, perform service, or enter Company property with a blood alcohol content greater than 0 00 percent and are prohibited from the use, possession or sale of alcoholic beverages while on duty or on Company property

Employes must not report for duty, perform service, or enter Company property under the influence of illegal controlled substances and are prohibited from their use, possession or sale while on duty or on Company property For purposes of this rule, any employe testing positive for a controlled substance (or its metabolite) in their urine is presumed to be under the influence of such drugs

Employes must not report for duty or perform service under the influence or impaired by prescription drugs, medications or other substances that may in any way adversely affect their alertness, coordination, reaction, response or safety

Employes operating Company vehicles at any time are subject to this rule

* * *

18. **Federal Railroad Administration Presumption of Impairment Notice—**

"Under Federal Railroad Administration (FRA) safety regulations, you may be required to provide a urine sample after certain accidents and incidents or at any time the Company reasonably suspects that you are under the influence of, or impaired by, drugs while on duty Because of its sensitivity, the urine test may reveal whether or not you have used certain drugs within the recent past (in a rare case, up to sixty days before the sample is collected) As a general matter, the test cannot distinguish between recent use off the job and current impairment. However, the Federal regulations provide that if only the urine test is available, a positive finding on that test will support a presumption that you were impaired at the time the sample was taken

"You can avoid this presumption of impairment by demanding to provide a blood sample at the same time the urine sample is collected The blood test will provide information pertinent to current impairment. Regardless of the outcome of the blood test, if you provide a blood sample there will be no presumption of impairment from a positive urine test " [See last paragraph for BN's policy]

"If you have used any drug off the job (other than a medication that you possessed lawfully) in the prior sixty days, it may be in your interest to provide a blood sample If you have not made unauthorized use of any drug in the prior sixty days, you can expect that the urine test will be negative; and you may not wish to provide a blood sample

"You are not required to provide a blood sample at any time, except in the case of certain accidents and incidents subject to Federal post accident testing requirements (49 CFR Part 219, Subpart C)

"A complete copy of the Federal regulations is available for your review at each Division Superintendent's office "

Burlington Northern rules are more restrictive than federal regulations regarding impairment to the extent that being on Company property under the influence of illegal controlled substances is prohibited It is not BN's policy to measure degree of impairment If a urine test indicates the presence of illegal controlled substances or their metabolites, that employee is presumed to be under the influence of such drugs and may be subject to disciplinary action under Rule G of the General Code of Operating Rules or the Rules of the Maintenance of Way, Rule 565 of Safety Rules and General Rules or other appropriate rules that govern the conduct of employees

APPENDIX F

1st Subdiv
MAIN LINE
STATIONS

WESTWARD	Length of Siding in Feet	Station Numbers	Line Segment	Mile Post Location		Office Calls		Rule 6(A)		Distance From Galesburg	EASTWARD
		20126		162 4		GT	GALESBURG	BJKRTX		0 0	
							5 9				
		20130		168 4			GRAHAM	LJ		5 9	
							10 9				
	C5,227	20141		179.0		CG	MONMOUTH	X		16 8	
							5 8				
		20146		185 0	DT		KIRKWOOD	X	ABS Rule 251	22 6	
							11.2				
		20158		196 1			GLADSTONE	X		33 8	
							6 3				
				202 4			CONNETT			40 1	
							3 0		CTC		
		20167		205 4	2MT	BN	BURLINGTON	BJKRX		43.1	
							3 9				
		20171		209 3			W BURLINGTON	YX(2)Y		47 0	
							3 4				
	E7,655	20174		212 5			DAYMAN	X		50 4	
							11 9				
	W6,561 E6,482	20186		224 6			NEW LONDON	X		62 3	
							8 6				
		20195		233 2			MT PLEASANT	X		70 9	
					DT		16 9				
		20212		250 1			BECKWITH	X	ABS Rule 251	87.8	
							5 1				
		20217	1	255 4			FAIRFIELD	X(2)		92 9	
							10 9				
		20228		266 1			BATAVIA	X		103 8	
							13 5				
		20241		279 6		CW	OTTUMWA	BKRX(2)Y		117 3	
							9 4				
		20251		289 0			NBU SWITCH	X		126 7	
							12 9E				
		20263		301 9			MAXON			139 4	
					2MT		1 8W		CTC		
		20265		303 7		A	ALBIA	LJ		141 2	
							3 8W				
		20269		307 5			HALPIN			145 0	
							11 1				
		20280		318 6	DT		MELROSE	X	ABS Rule 251	156 1	
							8 2				
		20288		326 8			RUSSELL	X		164 3	
							7.5				
		20296		334 3	2MT	CH	CHARITON	YX	CTC	171.8	
							7 7				
				342 0			SHANNON	X		179 5	
							17 7				
		20321		359 7			OSCEOLA	X		197.2	
							10 7				
		20332		370 4			MURRAY	X		207 9	
							5 4		ABS Rule 251		
		20337		375 9	DT		THAYER	X		213.3	
							7 7				
		20345		383 6			AFTON	X		221.0	
							9 3				
		20355		392.9		CR	CRESTON	BKRTXY		230.3	

BN Radio Channel No 1 and No 2 in service on this Subdivision.

Train Dispatcher Calls—West Burlington-12, Fairfield (Leando)-13, Ottumwa (East)-14, Ottumwa (West)-15, Albia (NS)-16, Albia (BN) (Oskaloosa)-17, Chariton (Williamson)-18, Osceola-19, Creston-11

See inside of back cover for routes, times and station stops for NRPC trains.

1. Speed Restrictions— Zone—Between	Maximum Speeds Permitted Passenger	Freight
Galesburg and Creston	79 MPH	
Against the current of traffic on double track	59 MPH.	49 MPH
Loaded ore and taconite trains		35 MPH
Between MP 161 7 and MP 168.4 Chicago Division Second Subdiv Timetable governs.		
Turnouts at following locations:		
MP 169 0 eastward track	70 MPH	
MP 169 0 westward track.	50 MPH	50 MPH
East end of eastward freight trains passing signal S-170		55 MPH
MP 176.3 and MP 176.56	70 MPH	

APPENDIX F

BURLINGTON NORTHERN RAILROAD

SAFETY RULES

AND

GENERAL RULES

SAFETY POLICY

Safety is essential for efficient transportation Managerial concern for accident prevention shall manifest itself throughout our company. To this objective, the management of the company is dedicated

The policy of Burlington Northern is to provide an efficient, safe transportation service, with personal safety as an absolute requirement in all activities

NOTICE

The Safety rules and instructions contained herein govern all employees of Burlington Northern Railroad Company and its employees of the railroads operated by it They take effect August 1, 1981 superseding Safety Rules Form 15001 that took effect March 1, 1973

Employees in any situation not provided herein shall act as directed by the supervisor, or, if not direct ly supervised, act as their own best judgment dictates, however, such judgment should supplement the rules and never deviate therefrom It should be noted, these rules apply to employees of all crafts when in areas covered by specific rules

Assistance and guidance to new employees is earnestly solicited so that they may acquire proper safety habits Suggestions for the advancement of safety in any branch of the service is solicited

W F Thompson
Senior Vice President, Operations

Approved: I. C Ethington
Executive Vice President

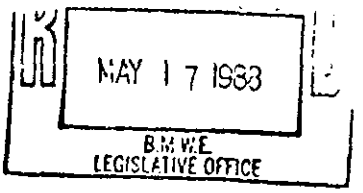
* * *

565. The use of alcoholic beverages, intoxicants, narcotics, marijuana or other controlled substances by employees subject to duty, or their possession or use while on duty or on Company property, is prohibited

APPENDIX G

RULE CHANGE, GENERAL ORDER, AND NOTICES

BN RULE G RULE CHANGE



Overland Park, Kansas
January 19, 1987

Files: 100580, 122140, 112380

Messrs	D E Baker	J Tierney	T J Matthews
	T. R Hackney	W E Greenwood	T V. Mears
	R S Howery	E W. Burke	W. A. Thompson
	W W Francis	J R. Galassi	H P Burton
	E. H Harrison	E L Bauer	

SUBJECT: Rule G

Please arrange to have the necessary instructions or superintendent's general orders and notices issued with the following rule change.

"Effective February 1, 1987, Rule G in the General Code of Operating Rules and Rules of the Maintenance of Way, Rule 565 in the Safety Rules And General Rules as modified in current timetable, and Rule I-9 of the Intermodal/Automobile Facility Safety Rules and General Rules is changed to read:

> The use of alcoholic beverages, intoxicants, narcotics, marijuana or other controlled substances by employes subject to duty, or their possession or use while on duty or on Company property, is prohibited
>
> Employes must not report for duty under the influence of any alcoholic beverage, intoxicant, narcotic, marijuana or other controlled substance, or medication, including those prescribed by a doctor, that may in any way adversely affect their alertness, coordination, reaction, response or safety "

With this rule change and the "subject to duty" provision reestablished, it is imperative that this provision be thoroughly reviewed in all operating and maintenance of way rules classes

Those pages in BN's Supervisor's Handbook of FRA Regulations and BN Policy and Procedures Concerning the Control of DRUG and ALCOHOL USE In Railroad Operations will be revised and forwarded in the near future.

R. L. Buchanan

cc:	D R Wood	W A Hatton	J. B Dagnon	J J. Button	M A Voelker
	D. W Fish	A. D Bengtson	A. L Lindsey	B. C. Bidwell	E. M. Welander

APPENDIX G

GENERAL ORDER NO. 15

DIVISION	SUBDIVISION	DATE
GALESBURG	ALL	January 30, 1987

Effective February 1, 1987, Rule G in the General Code of Operating Rules and Rules of the Maintenance of Way, Rule 565 in the Safety Rules and General Rules as modified in current timetable, and Rule I-9 of the Intermodal/Automobile Facility Safety Rules and General Rules is changed to read:

> The use of alcoholic Beverages, intoxicants, narcotics, marijuana or other controlled substances by employes subject to duty, or their possession or use while on duty or on Company property, is prohibited.
>
> Employes must not report for duty under the influence of any alcoholic beverage, intoxicant, narcotic, marijuana or other controlled substance, or medication, including those prescribed by a doctor, that may in any way adversely affect their alertness, coordination, reaction, response or safety.

01441-11

GENERAL ORDER NO	SUPERINTENDENT
15	J. B. EVANS
POSTED BY	TIME AND DATE

FORM 15881 4-86

APPENDIX G

NOTICE NO. 15

NOTICE NO.	SUBDIVISION	DIVISION	DATE
15	ALL	GALESBURG	January 30, 1987

Effective February 1, 1987, Rule G in the General Code of Operating Rules and Rules of the Maintenance of Way, Rule 565 in the Safety Rules and General Rules as modified in current timetable, and Rule I-9 of the Intermodal/Automobile Facility Safety Rules and General Rules is changed to read:

> The use of alcoholic beverages, intoxicants, narcotics, marijuana or other controlled substances by employes subject to duty or their possession or use while on duty or on Company property, is prohibited.
>
> Employees must not report for duty under the influence of any alcoholic beverage, intoxicant, narcotic, marijuana or other controlled substance, or medication, including those prescribed by a doctor, that may in any way adversely affect their alertness, coordination, reaction, response or safety.

01451-9

NOTICE NO. 15	SUPERINTENDENT J. B. EVANS
POSTED BY	TIME AND DATE

Form 15442 4-82

APPENDIX G

NOTICE NO. 5

NOTICE NO.	SUBDIVISION	DIVISION	DATE
5	ALL	GALESBURG	January 1, 1987

FEDERAL RAILROAD ADMINISTRATION PRESUMPTION OF IMPAIRMENT NOTICE

Under Federal Railroad Administration (FRA) safety regulations, you may be required to provide a urine sample after certain accidents and incidents or at any time the Company reasonably suspects that you are under the influence of, or impaired by, drugs while on duty. Because of its sensitivity, the urine test may reveal whether or not you have used certain drugs within the recent past (in a rare case, up to sixty days before the sample is collected). As a general matter, the test cannot distinguish between recent use off the job and current impairment. However, the Federal regulations provide that if only the urine test is available, a positive finding on that test will support a presumption that you were impaired at the time the sample was taken.

"You can avoid this presumption of impairment by demanding to provide a blood sample at the same time the urine sample is collected. The blood test will provide information pertinent to current impairment. Regardless of the outcome of the blood test, if you provide a blood sample, there will be no presumption of impairment from a positive urine test. (See last paragraph for BN's policy.)

If you have used any drug off the job (other than a medication that you possessed lawfully) in the prior sixty days, it may be in your interest to provide a blood sample. If you have not made unauthorized use of any drug in the prior sixty days, you can expect that the urine test will be negative; and you may not wish to provide a blood sample.

You are not required to provide a blood sample at any time, except in the case of certain accidents and incidents subject to Federal post-accident testing requirements (49 CFR Part 219, Subpart C).

A complete copy of the Federal regulations is available for your review at each Division Superintendent's office."

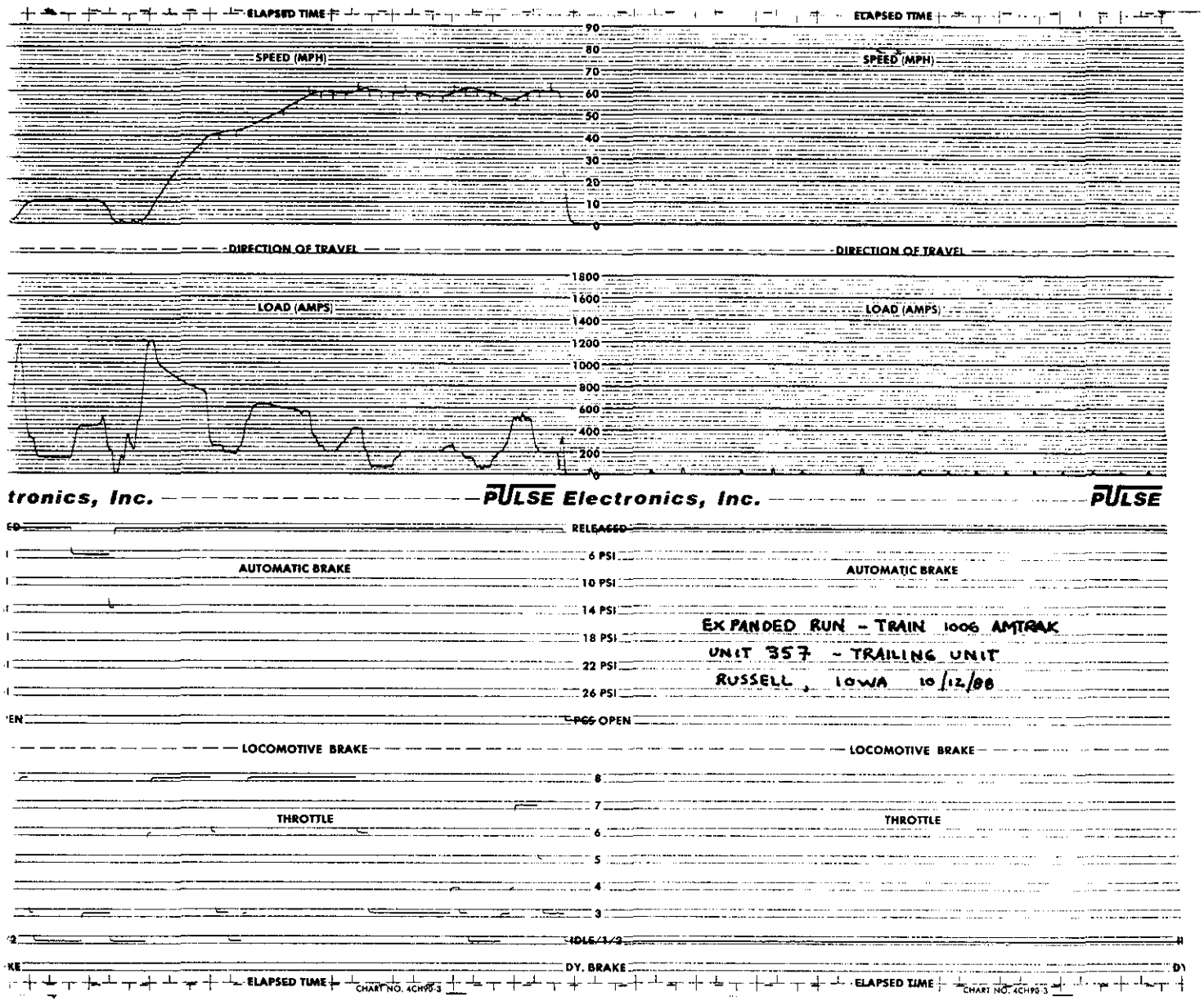
Burlington Northern rules are more restrictive than federal regulations regarding impairment to the extent that being on Company property under the influence of illegal controlled substances is prohibited. It is not BN's policy to measure degree of impairment. If a urine test indicates the presence of illegal controlled substances or their metabolites, that employee is presumed to be under the influence of such drugs and may be subject to disciplinary action under Rule G of the Consolidated Code of Operating Rules or the Rules of the Maintenance of Way Department, Rule 565 of Safety Rules and General Rules or other appropriate rules that govern the conduct of employees.

NOTICE NO. 5	SUPERINTENDENT J. B. EVANS
POSTED BY	TIME AND DATE

Form 5442 4-82

APPENDIX H

STRIP CHART FROM EVENT RECORDER OF UNIT 357



APPENDIX I

PULSE ELECTRONICS, INC.
ENGINEERING STANDARD PROCEDURE
TO ESTABLISH STOPPING DISTANCE

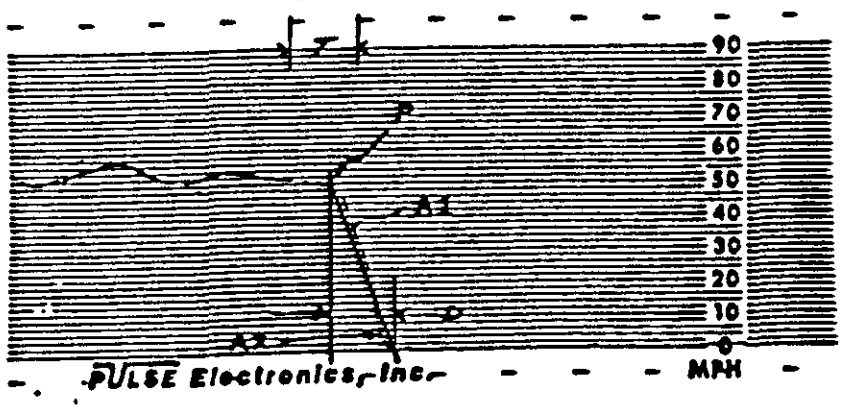
ENGINEERING STANDARD		PAGE 1 OF 1
DESCRIPTION Procedure to Establish Stopping Distance	APPROVED	NUMBER 053080
DATE ISSUED May 30, 1980	DATE REVISED	

- Run "expanded" view of chart segment.
- Establish point where deceleration started and mark it "P".
- Draw a vertical line from point "P" to the 0 M.P.H. base line.
- Draw a slanted line from point "P" to the 0 M.P.H. base line. IMPORTANT: In drawing this line make sure that there is approximately the same area between the slanted line and the speed trace to the right and left of the slanted line. (see areas A1 and A2 below).
- Compute the stopping distance in feet with the following formula:

Stopping distance = $\frac{P \times D \times 44}{T}$ (feet)

P=Speed at "P" in M.P.H.
D=Chart distance in inches (or cm.) *
T=Chart distance in inches (or cm.) *

* Note: A ruler graduated in 1/10 facilitates the computations.



EXAMPLE:

P = 50 M.P.H.
D = 0.42 inches (1.07 cm.)
T = 0.45 inches (1.14 cm.)

Stopping Distance = $\frac{50 \times 0.42 \times 44}{0.45}$

Stopping Distance = 2053 feet.

PULSE Electronics, Inc.

APPENDIX I

By using the Pulse Electronics, Inc 's Engineering Standard Procedure to Establish Stopping Distance, the approximate stopping distance for train 6 was calculated

P = 60 MPH
D = 0 22 inches
T = 0 48 inches

$$\text{Stopping Distance} = \frac{60 \times 0.22 \times 44}{0\ 48}$$

Stopping Distance = 1,210 feet

APPENDIX J

FEDERAL RAILROAD ADMINISTRATION RESPONSE TO SAFETY RECOMMENDATION R-87-23

US Department
of Transportation
**Federal Railroad
Administration**

Office of the Administrator

400 Seventh St S W
Washington D C 20590

APR 2 0 1988

The Honorable James Burnett, Jr.
Chairman
National Transportation Safety Board
800 Independence Ave., S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

I write to update the Board on recent FRA activities relative to design improvements in locomotive control compartments. I know that the Board shares a strong interest in these issues, as evidenced by its recommendation R-87-23.

FRA has focused on the issues of locomotive cab design and crash survivability three times over the past 15 years.

In 1972, the initial FRA study -- "Human Factors Survey of Locomotive Cabs" -- focused on the human factor element in cab design, including construction of cab interiors, design of controls and displays, atmospheric conditions and train vigilance. As a result of these efforts, the AAR mechanical division produced a Manual of Standards governing "clean cab" items. Most of these standards became effective for new road or switch locomotives ordered after March 1, 1975.

In 1982, FRA concluded a second study, "Analysis of Locomotive Cabs," which focused on the crashworthiness of in-service locomotives and design applications for new locomotives to protect occupants from serious or fatal injuries during collisions. That study recommended a series of design improvements, including installation of collision/roll posts, shelf couplers and anti-climbers to mitigate car override, and secondary impact protection, such as safety glass and emergency exits. The Canadian National has incorporated the most important aspects of these recommendations in its GM-EMD locomotive design, but they have yet to achieve universal acceptance.

In 1984, FRA decided to place increased emphasis on cab environment issues. That decision was based partially on site inspections of accidents occuring in 1983-1984, and on a recognition that both American locomotive manufacturers --

APPENDIX J

GM-EMD and General Electric -- would be considering major design modifications to their products in the late 1980's. It has been our objective to promote an agreement between the two manufacturers to include a series of design improvements in the cabs of their new basic models.

The first step in that process involved assessing the issues raised in accident and on site investigations, and determining where design concepts existed that might address those issues. Bill Loftus, FRA Executive Director, assumed control of that project. Initially, FRA dealt directly with the carriers and manufacturers in acquiring this information, and assessing the various proposals. We came to recognize, however, that the Ad Hoc Locomotve Control Compartment Committee (LCCC) was a better vehicle, because of the diversity of interests represented on the committee, as well as its preexisting focus on control cab issues. FRA has focused its resources on vitalizing the LCCC, and it has become the focal point for both industry and FRA efforts.

I realize that the Board is familiar with the committee's activities from its own involvement, and it would serve no purpose to detail here the numerous actions undertaken under its aegis over the past three years. It is worth noting, however, that the committee (and the FRA) have evaluated numerous proposals for design improvements, and proposed a list of specific areas in which near term improvements may be achievable. A copy of that list is attached to this letter as Exhibit A. These items have been discussed with both American manufacturers, and FRA is absorbing the cost of contracting for a carrier survey to assess the impact and technical feasibility of the proposed changes. The purpose is to bridge the gap between the current consensus on desirable design changes and actual manufacturing specifications. The resulting design will be incorporated in a mock up "model cab" to be constructed by the manufacturers in conjunction with the LCCC.

While that effort has been progressing, FRA has initiated independent research on several areas important to the redesign effort, efforts where adequate research data is unlikely to be available from other sources.

Finally, I continue to be of the view that a formal safety inquiry would be a useful tool in focusing industry attention on the issue of crash survivability. It would also provide a forum for those not yet involved in the LCCC deliberations to share

their views with FRA officials. We had originally intended to conduct such an inquiry in 1987, but as you know, the enormous time commitments required by the Chase, Maryland accident investigation and follow-up activities (including the ATC rulemaking) forced us to alter our regulatory schedule in several respects. Because the locomotive cab inquiry was not a prerequisite to continued progress in the LCCC effort, we elected to defer it to the current fiscal year. We have tentatively scheduled hearings for the September-October 1988 time block, and I expect to finalize that schedule in the near future. We will inform the Board when the date and location of the hearing are set, and would of course welcome Board participation. We will also keep you apprised of any material developments in the interim.

Yours very truly,

John H. Riley
Administrator

Attachment: Exhibit A

APPENDIX J

Windows

1. Size, location, and material
2. Defrosting

Cab Size

1. Square feet required
2. Wide body--increased seating

Lighting, Heating, and Ventilation

1. Spot and floor lighting; lighting controls
2. Underfloor heating
3. Fresh air injection
4. Filtered air

Rearrangement of Control Stand Devices

1. Ergonomic principles for layout
2. Larger gauges for visibility
3. Location of auxiliary devices, i.e., end of train, ATCS devices, radio equipment

Insulation

1. Increased noise insulation
2. Reduced heat transfer

Environment Considerations

1. Lunch trays and beverage holder
2. Clothes valet
3. Toilet facility and location
4. Refrigeration and hot plate application
5. Modern interior surface finishes

Seating

1. Location and number
2. Style

Communications

1. Location of speedometer
2. Cab speakers

* U.S. GOVERNMENT PRINTING OFFICE:1988-201-610:81016