PB 231 134

SS-R-25

RAILROAD ACCIDENT REPORT

REAR-END COLLISION OF TWO SOUTHERN PACIFIC TRANSPORTATION COMPANY FREIGHT TRAINS

INDIO, CALIFORNIA
JUNE 25, 1973

ADOPTED: March 20, 1974

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NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. Department of Commerce
Springfield VA 22151

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20591
REPORT NUMBER: NTSB-RAR-74-1

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. NTSB-RAR-74-1	2. Government Accession No.	3. Recipient's Catalog No. PB-231 134
4. Title and Subtitle Railroad Accident Report - Rear-end Collision of Two Southern Pacific Transportation Company Freight Trains, Indio, California, June 25, 1973.		5. Report Date March 20, 1974 6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No.
9. Performing Organization Name and Address National Transportation Safety Board Bureau of Surface Transportation Safety Washington, D. C. 20591		10. Work Unit No. 1259 11. Contract or Grant No.
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20591		13. Type of Report and Period Covered Railroad Accident Report June 25, 1973 14. Sponsoring Agency Code

15. Supplementary Notes

This report contains Railroad Safety Recommendations R-74-9 through R-74-12.

16. Abstract

This report describes and analyzes a rear-end collision between two Southern Pacific Transportation Company freight trains in the SP yard at Indio, California, on June 25, 1973. Extra 8992 West, after having entered the yard, struck the rear of Extra 8659 West, which was standing on the westbound main track. All five locomotive units of Extra 8992 West were destroyed, and 25 cars of the two colliding trains were derailed. The engineer and the front brakeman of Extra 8992 West were killed. Eight cars of a train on an adjacent track were also derailed.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the crew of the Extra 8992 West to stop their train, which was being operated at an excessive speed by an engineer under the influence of alcohol. Contributing to this failure was the ineffectiveness of the Southern Pacific in assuring compliance with its operating rules and procedures which were specifically designed to prevent an accident if a crewmember failed to perform his duties.

The report contains recommendations addressed to the Federal Railroad Administration and the Southern Pacific Transportation Company intended to prevent the recurrence of this type of accident.

17. Key Words Railroad Accident, Rear-end Collision, Freight Train, Alcohol, Failure to Control Speed, Passed Stop Signal, Traffic-control System, Excessive Speed.		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22151.	
19. Security Classification (of this report) UNCLASSIFIED	20. Security Classification (of this page) UNCLASSIFIED	21. No. of Pages 27	22. Price $3.25=1.45

NTSB Form 1765.2 (11/70)

FOREWORD

The accident described in this report has been designated as a major accident by the National Transportation Safety Board under the criteria established in the Safety Board's regulations.

This report is based on facts obtained from an investigation conducted by the Safety Board, in cooperation with the Federal Railroad Administration. The conclusions, the determination of probable cause, and the recommendations are those of the Safety Board.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20591
RAILROAD ACCIDENT REPORT

Adopted: March 20, 1974

Rear-end Collision of Two Southern Pacific Transportation Company Freight Trains, Indio, California, June 25, 1973

SYNOPSIS

At 12:45 a.m., on June 25, 1973, Southern Pacific freight train Extra 8992 West collided with the rear end of Southern Pacific freight train Extra 8659 West, which was standing on the westbound track in the yard at Indio, California. The five locomotive units of Extra 8992 West were destroyed. Twenty-five cars of the two colliding trains and eight cars of a train on an adjacent track were derailed and damaged. The engineer and the front brakeman of Extra 8992 West were killed.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the crew of Extra 8992 West to stop their train, which was being operated at excessive speed by an engineer under the influence of alcohol. Contributing to this failure was the ineffectiveness of the Southern Pacific in assuring compliance with its operating rules and procedures which were specifically designed to prevent an accident if a crewmember failed to perform his duties.

FACTS

The Accident

At about 12:45 a.m., on June 25, 1973, a Southern Pacific Transportation Company (SP) freight train, Extra 8992 West (train APW), collided with the rear of another SP freight train, Extra 8659 West (train GSX), on the westbound main track in the Indio, California, Yard. Indio Yard is located on the part of the SP's Los Angeles Division which extends 121.4 miles between Yuma, Arizona, and Indio. There was a single-track line between Yuma and Thermal, California, 6.6 miles east of Indio Yard, and a double-track line westward from Thermal through Indio Yard. Trains were operated on the single track by a traffic-control system and on the double track by an automatic-block signal system.

At the time of the accident, train GSX, which consisted of two locomotive units and 23 cars, had stopped on the westbound main track to change crews, with the rear of the train 6,025 feet west of signal 612.9. Another freight train, Extra 9214 East, was moving eastward slowly on the adjecent eastbound main track.

Train APW entered the westbound main track at Thermal at 12:38 a.m., passed signal 613.9, which displayed a yellow aspect, passed signal 612.9,

which displayed a red with a flashing white aspect, and entered Indio Yard. The train moved westward and passed the locomotive of Extra 9214 East without acknowledging the dimming of the headlight by the engineer of the eastbound train. The speed of train APW was not significantly reduced. After train APW failed to acknowledge stop signals given by the flagman of train GSX, train APW collided with the rear end of train GSX. Train APW traveled the 7.03 miles from Thermal to the point of collision in 7 minutes, at an average speed of about 60 mph.

When the engineer of Extra 9214 East saw train APW approaching on the westbound main track, its headlight was on bright and the white oscillating headlight was on bright in the stationary mode. From the sound of the engines he assumed that power was being applied to the locomotive. He dimmed his headlight as required by the Operating Rules, 1/ but the engineer on train APW did not dim his. The employes on the eastbound train's locomotive saw neither the engineer nor the front brakeman of train APW as the locomotives passed each other. These employes were not sure whether there was an emergency application of the brakes on train APW before the collision with train GSX.

Before the collision, the flagman of train GSX was standing on the rear platform of the caboose inspecting the cars of Extra 9214 East, and the conductor was in the caboose. They both saw the headlights and heard the engines working on the approaching locomotive of train APW. The conductor yelled to the flagman to give the engineer a stop signal and to run to the north side of the yard. Neither of these employes heard brakes being applied nor saw the red oscillating headlight which would result from an emergency brake application.

The conductor and the flagman in the caboose of train APW were unable to observe the aspects displayed by signals 613.9 and 612.9 before the locomotive passed each signal. Both crewmembers thought that after the train passed Thermal, its speed appeared to be reduced, and they took no exceptions to its operation. The first indication they had of the accident was an emergency application of the brakes. After the train stopped, the conductor alighted from the caboose and walked forward along the train to ascertain the cause of the emergency brake application. He first encountered some derailed cars and then saw a fire in the vicinity of the locomotive. He continued forward and found that train APW had collided with the rear of another train.

Accident Site

The double-track main line which began at Thermal extended westward through Indio Yard. A number of yard tracks paralleled the main tracks

1/ Rule 17-C of the SP's Rules and Regulations of the Transportation Department. See the Appendix for pertinent sections from the Operating Rules.

on each side. Westbound trains approached Indio on straight tracks until they reached a point 4,439 feet west of signal 612.9. From this point, they traversed a 0° 30' curve to the left for a distance of 4,586 feet. Westbound trains approaching the collision point on the westbound main track ascended a 0.2-percent grade. A yard office was located along the north side of the yard about 2,680 feet west of the collision point. (See Figure 1.)

Method of Operation

Single track. Trains were operated in both directions on the single-track line between Yuma and Thermal by signals of the traffic-control system. Sidings were provided for the passing of trains. A train graph in the dispatcher's office in Los Angeles automatically recorded the time that trains passed control points at each end of the sidings.

Double track. Trains were operated westward from Thermal on the westbound track of the double-track line by signals of the automatic-block system. The train graph in the dispatcher's office did not record the time that trains passed points on this section of track. Signals 613.9 and 612.9, located 2.08 miles and 1.12 miles east of the collision point, respectively, displayed the following aspects when the westbound main track was occupied between signal 612.9 and the yard office:

Signal Number	Aspect	Indication	Name
613.9	Yellow	Proceed not exceeding medium speed, prepared to stop short of next home signal.	Approach Signal Yellow
612.9	Red with Flashing White	Stop. When flashing white displayed be governed by special instructions.	Flashing White

The carrier defined medium speed as a speed not exceeding 40 mph. The automatic-block signals were of the searchlight type and were approach-lighted. No form of cab signals or train control was provided by the SP on the Los Angeles Division.

Until a few months before the accident, special instructions contained in the SP timetable required that when the flashing white aspect of signal 612.9 was displayed, a westbound train could not proceed until the yardmaster or the switch tender told the crew on which track the train was to be yarded. However, the SP stopped all operations in Indio Yard except crew changes, and on April 6, 1973, SP issued Timetable Bulletin No. 27 which cancelled the special instructions which applied to the flashing white aspect of signal 612.9. The signal aspect was not changed, and it continued to display the red with flashing white aspect.

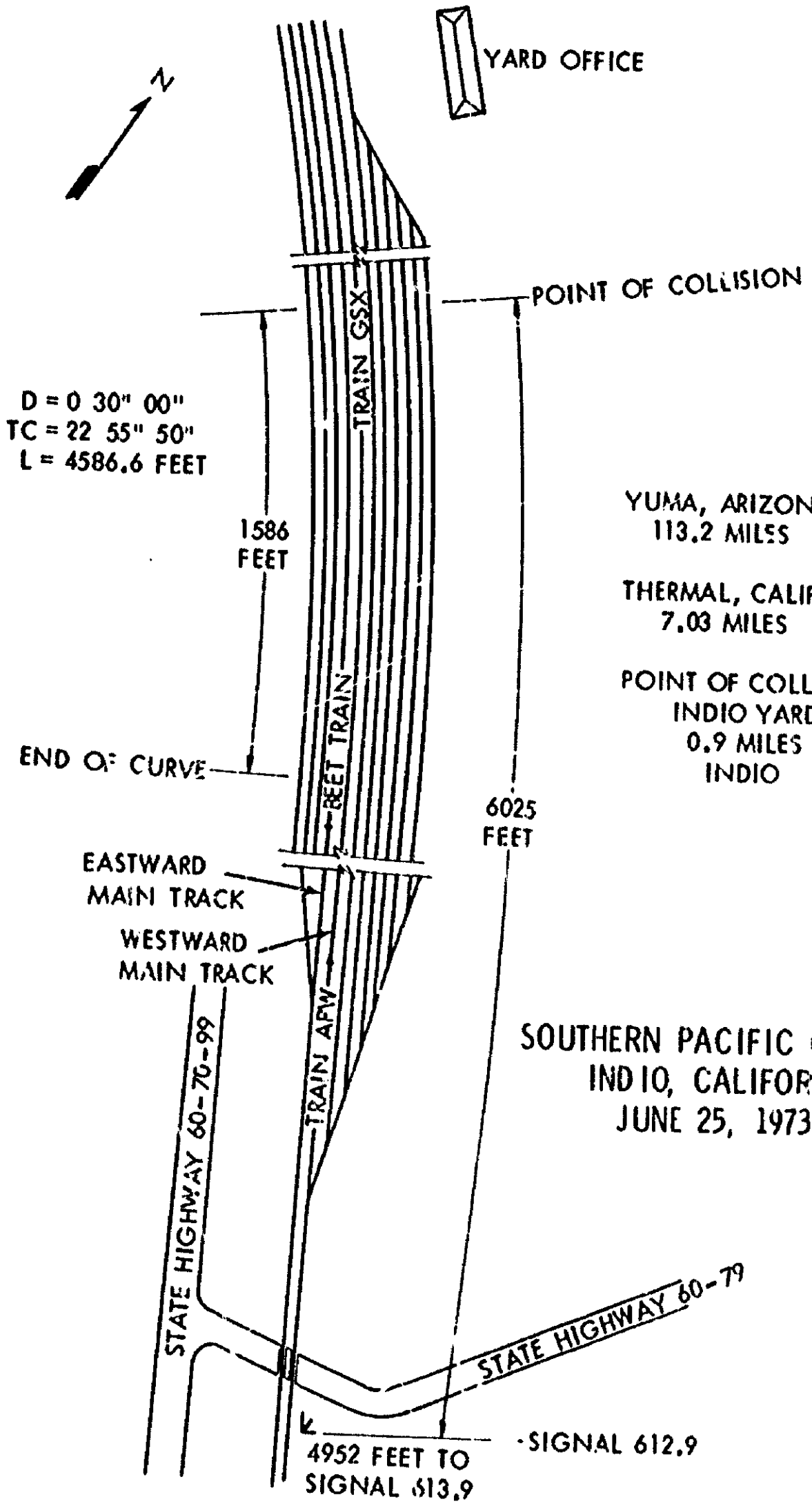


Figure 1. Accident site.

Crew changes. At Indio, most crew changes involving through trains took place while the train occupied the main tracks. After the inbound engineer stopped the locomotive in the vicinity of the yard office, he and the front brakeman were relieved by the outbound engineer and front brakeman. The train then moved slowly forward to enable the outbound conductor and flagman to inspect it and board the caboose to relieve the inbound conductor and the inbound flagman. The outbound conductor then informed the engineer by radio that the crew had boarded the caboose and the train was ready to proceed. Crews were changed on through trains at Yuma in the same manner.

Radios. Radios were installed on the locomotive and the caboose of train APW and train GSX. Crewmembers could converse with each other, with crewmembers of other trains, and with wayside stations and the train dispatcher's office.

Operating rules. Rule G of the SP's Operating Rules states, in part, that "use of alcoholic beverages, intoxicants, or narcotics by employees subject to duty, or their possession or use while on duty, is prohibited." (See Appendix.)

Rule 843 states that the general government of a train is vested in the conductor; all other persons employed on the train must obey his instructions. If there is any doubt as to authority or safety of proceeding, the conductor will consult with the engineer, who will be responsible with him for the safety and proper handling of the train.

Rule 845 requires, in part, that the conductor must assure himself that subordinates are competent. He will instruct them, if necessary, in the proper performance of their duties.

Maximum authorized speed. The maximum authorized speed for train APW was 70 mph between Yuma and Thermal, 50 mph between Thermal and Indio, and 30 mph on the main track within Indio Yard. An advance speed restriction sign for the 30-mph restriction was located along the north side of the westbound main track 1.64 miles east of signal 612.9. Between Yuma and Thermal there were four additional speed restrictions.

Locomotive Equipment

All SP locomotives had an electrically-actuated, pedal-type safety control, i.e., a dead-man control. The safety device, however, could be cut out, and the SP allowed the engineer to use the device at his discretion. The Code of Federal Regulations does not require that a dead-man control be in service on locomotives.

Each locomotive was also provided with an overspeed device, which was actuated at 73 to 75 mph. When the overspeed device was actuated on a

locomotive unit similar to the lead unit on train APW, the power control (PC) switch reduced the engines to idle and produced a service application of the automatic train brakes. When the overspeed device on the lead locomotive unit was cut out, the effects of both the overspeed device and the dead-man control were nullified. SP operating rules did require that the overspeed device be operable and that a report be made when it was cut out.

In addition to the standard headlight, an oscillating headlight which contained both white and red lights was provided on the front of the lead locomotive of train APW. The engineer could operate both the white and the red lights manually, but the red light would also operate automatically when the train brakes were applied in emergency and would continue to oscillate until reset.

Precrash Operation of Train APW

Train APW consisted of five locomotive units, 70 cars, and a caboose. Because most of the cars were loaded with either automobiles or automobile parts, the train was given preferential handling, which included permission to operate at a higher maximum speed (70 mph) than most freight trains.

The train arrived in Yuma, and the crew was changed in the prescribed manner. Personnel of the mechanical department, however, had to inspect the wheels of the lead tive unit for flat spots which were reported by the inbound engineer. The flat spots were not of sufficient size to require removal of the unit from the train. No other exceptions were taken, and the train departed from Yuma at 10:45 p.m. on June 24. There was no report regarding the overspeed device.

The outbound conductor said that all of his radio calls to the crewmembers on the locomotive to report the crew aboard at Yuma and to report on the indications of detectors en route were answered by the front brakeman. He did not consider it unusual that he did not speak to the engineer.

The train did not stop between Yuma and Indio. The conductor said that at one point the train's speed appeared to be greater than the maximum speed, but, before he could call the engineer, the speed appeared to be reduced. He did not compute the speed of the train, and the caboose was not provided with a speedometer. Train AIW reduced speed for the four speed restrictions between Yuma and Indio and also reduced speed while passing an eastbound train which had entered a siding. Train APW traveled the 113.2 miles between Yuma and Thermal in 1 hour 50 minutes and entered the double-track line at 12:38 a.m., on June 25. An analysis of the train graph indicated that train APW averaged about 77 mph over the 45.2 miles between the east switch at Clyde and the east switch at Wister. Included in that distance were 3.5 miles in which the maximum

authorized speed was 60 mph. While traversing the 14.1 miles between the east switch at Iris and the east switch at Wister, the speed of train APW averaged 94 mph. The last 15 miles checked by the train graph indicated that train APW passed through a 2.4-mile-long, 40-mph zone and a 5.74-mile-long, 50-mph zone at an average speed of 59 mph. (See Figure 2.)

Crew of Train APW

The engineer of train APW had been called for duty at Indio to operate a train which departed from Indio at 2 a.m., on June 24. After arriving in Yuma, the engineer marked off duty at about 8:30 a.m. The other crewmembers of train APW had arrived in Yuma on a train which left Indio at 3:30 a.m. and had marked off duty about 10 a.m. The engineer spent the rest of the morning driving around Yuma with several friends and looking at fishing locations. During this time, the engineer reportedly consumed some beer. After returning to Yuma at about noon, the engineer and his friends decided to play cards. In looking for players for the game, the engineer contacted a brakeman at his rooming house. The brakeman said that it was evident that the engineer had been drinking but that his condition was "not too bad." The card game was started at 4 p.m. The engineer continued to play cards until he was called to operate train APW from Yuma to depart at 10:30 p.m.

The front brakeman of train APW stayed in a lounge during most of his off-duty time in Yuma. This lounge was provided by the SP near the yard office for crewmembers who did not have enough time off duty to go to bed. During off-duty hours, the front brakeman generally did not drink, and, in order to save money, he usually stayed in the lounge rather than rent a bedroom.

The conductor and flagman each rested in bed during their off-duty time in Yuma; neither one saw the engineer until they reported for duty for train APW.

The conductor said that the only conversation which he had with the engineer after reporting for duty was across the room of the crew caller's office; he was not close enough to detect alcohol on the engineer's breath. The conductor further stated that the engineer's actions did not arouse his suspicion. He thought that the engineer appeared tired but assumed that he was physically fit for duty. The engineer remarked to the conductor that he was tired and would be glad when the trip was over. The conductor warned the front brakeman to stay awake and to be sure to call all signal aspects to the engineer.

Accident Losses

When the locomotive of train APW struck the 25-ton caboose of train GSX, the caboose raised upwards and overrode the underframe of the first

RATES OF GRADE TAKEN FROM TRACK CHARTS AND SHOWN IN PERCENTAGE IN THE DIRECTION OF MOVEMENT M.P. %	LOCATION	AUTHORIZED SPEED JUNE 24-25		BEGINNING OF DETECTOR CIRCUIT MP	01-APW2-22		01-APW2-22
732.1	1ST [illegible] SWITCH	732.10					
-0.56	WEST OF COLORADO RIVER		60 mph	732.28			10:48PM
731.4							
-0.00	CROSSOVER SWITCH						
727.6	BETWEEN YUMA - ARAZ JCT			729.07	22.66		10:56.30
+1.01							
723.3	SWITCH ARAZ JCT			725.90	54.34		11:00
+0.70		727.00	50				
718.95	EAST SWITCH DUNES	723.06		721.60	43.00		11:06
-0.50	WEST SWITCH DUNES			719.95	33.00	2.49 HPT	11:09
718.65							
+0.61	EAST SWITCH CACTUS			713.60	50.80		11:16.30
717.9	WEST SWITCH CACTUS			711.95	66.00		11:18
+0.34							
710.9	EAST SWITCH CLYDE		70 mph	706.66	63.48		11:23
-0.08	WEST SWITCH CLYDE			705.00	49.80		11:25
703.0							
-0.20	EAST SWITCH GLAMIS			698.74	75.12		11:30
700.7	WEST SWITCH GLAMIS			697.09	49.50		11:32
-0.33							
692.75	EAST SWITCH ACOLITA			690.48	79.32		11:37
+0.23	WEST SWITCH ACOLITA			688.81	66.80	77.47 mph	11:38.30
687.35							
-0.70	EAST SWITCH REGINA			682.94	78.27		11:43
682.65	WEST SWITCH REGINA	680.50		681.21	77.85		11:44.20
+0.34		TT. BULL #27	60				
680.7		677.00					
-0.60	EAST SWITCH IRIS			675.59	72.26		11:49
673.55	WEST SWITCH IRIS			673.92	100.20	94.13 mph	11:50
-1.00							
671.1	EAST SWITCH NILAND			668.05	88.05		11:54
-0.35	WEST SWITCH NILAND			665.69	94.40		11:55.30
662.5							
+0.25	EAST SWITCH WISTER			661.47	101.28		11:58
662.4	WEST SWITCH WISTER			659.83	59.04		11:59.40
+0.08							
658.15	EAST SWITCH FRINK		70 mph	656.12	83.48		12:02.20AM
+0.37	WEST SWITCH FRINK			654.48	73.80		12:03.40
656.0							
-0.35	EAST SWITCH BERTRAM			647.83	68.40		12:09.30
653.2	WEST SWITCH BERTRAM			646.19	65.60		12:11
+0.28							
653.0	EAST SWITCH FERRUM			640.58	63.11		12:16.20
-0.37	WEST SWITCH FERRUM			639.00	56.88		12:18
652.7							
0.00	EAST SWITCH MORTMAR	634.20	40	634.64	65.40		12:22
650.4	WEST SWITCH MORTMAR	631.80		632.98	39.84		12:24.30
+0.37		TT. BULL #35					
650.0	EAST SWITCH MECCA			626.13	74.73		12:30
-0.28	WEST SWITCH MECCA			624.55	47.40		12:32
648.6							
+0.22	EAST SWITCH THERMAL		70 mph	620.21	57.87		12:36.30
647.8	WEST SWITCH THERMAL	613.50	50	618.83	55.20		12:38
-0.20		612.75					
646.9	IMPACT POINT - INDIO	TT. BULL #27	30	611.80	60.26		12:45
+0.40	INDIO YARD	610.80		611.30	-----		-----
644.4							1 HR 57 MIN
-0.20							
643.0							
+0.30							
641.3							
+0.40							
630.7							
+0.35							
629.5							
-0.21							
629.1							
+0.01							
628.3							
-0.14							
626.0							
+0.42							
610.0							

Figure 2. Excerpts from SP train graph. (The mileposts shown are at the beginning of the detector circuits at each switch.)

locomotive unit. It demolished the short end of the unit and the control compartment back to the engine compartment. The caboose then slid over the roof of the engine compartment and smashed the control compartment of the second locomotive unit before it was thrown onto its roof along the north side of the track. The interior of the caboose was set on fire and was completely destroyed.

A portion of the control compartment was torn from the first locomotive of train APW and was thrown along the north side of the track near the caboose. As train APW continued northward after the collision, the locomotive plowed through the seven rear cars of train GSX. The fuel tanks of several of the locomotive units were punctured; diesel fuel sprayed over the wreckage and ignited. All five locomotive units and the first seven cars on train APW were derailed and destroyed. In addition, the 31st car and the 10 cars in back of the 31st car were derailed and heavily damaged as a result of the impact.

Eight cars of Extra 9214 East on the adjacent track were derailed and damaged when they were struck by the derailing equipment of the colliding trains. (See Figure 3.)

The engineer and front brakeman of train APW were killed. The engineer's body was found in the vicinity of the torn-off portion of the control compartment of the first locomotive unit; the front brakeman's body was found in the destroyed portion of the control compartment which remained with the first unit. Five of six aliens reported to have been riding on the seventh car of train APW were apprehended and were found to have sustained minor injuries in the accident.

A considerable amount of track was damaged by the collision. A monetary estimate of the accident damage is as follows:

Track	$ 84,000
Locomotives	1,011,099
Cars	322,100
Lading	215,000
	$1,632,199

Postaccident Examination of Fatally Injured Crewmembers

Postmortem examinations of the bodies of the engineer and front brakeman were made by a private medical laboratory. The autopsies did not indicate any systemic failure which would have impaired either man's ability to function. Blood tests are as follows:

	Engineer	Front Brakeman
Percent of Alcohol	0.16	0.01
Carbon Monoxide	None	None
Drugs	None	None

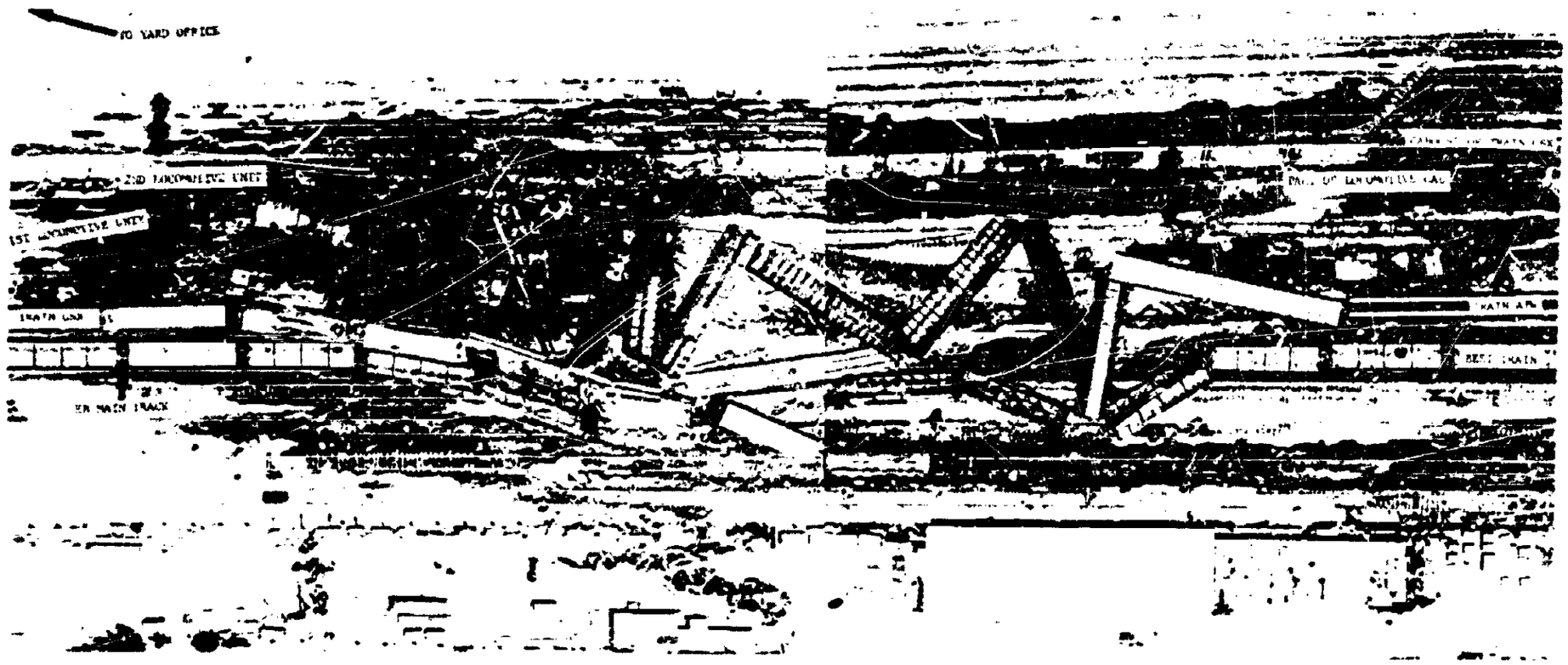


Figure 3. Aerial view of wreckage after the collision.

A finding of 0.01 blood alcohol is within the margin of error and is not necessarily the result of alcohol consumption by the subject.

It was impractical to make crash-injury analyses of the brakeman and engineer because their injuries were too massive to be individually significant.

Postaccident Inspection of the Signal System

Tests by SP personnel indicated that when a train occupied the westbound main track at the point of collision, signal 613.9 displayed a yellow aspect and signal 612.9 displayed a red with a flashing white aspect. No conditions or circumstances were found that would indicate the signals could display any aspect except those intended.

A crewmember seated on the north side of the bay window of the caboose of a westbound train slightly shorter than train APW could observe the aspects displayed by signal 615.5, the next signal east of 613.9, before the locomotive passed the signal. However, he could not observe the aspects of signals 613.9 and 612.9 before the locomotive passed the signals.

A caboose placed on the westbound track at the point of the collision, with a train on the eastbound main track, was not visible to the locomotive crew of an approaching westbound train until the locomotive was within 1,380 feet of the caboose.

Postaccident Inspection of the Locomotive Controls

Although the control compartment of the first locomotive unit on train APW was completely destroyed and the control stand was smashed through the floor of the compartment, the position of most of the controls could be determined. Unfortunately, since the forces in the collision could have changed them, the positions were generally irrelevant. However, the overspeed cutout cock, which was found in the cutout position, could not have been changed by the collision forces.

Instruction Program for Trainmen

Before newly hired trainmen were permitted to assume their duties, the SP required that they receive several days of classroom instruction on the equipment, on the book of rules, and on safety on the job. After the classroom instruction, new employes received on-the-job training by working with a crew as a student brakeman or switchman.

The front brakeman of train APW had been employed at Bakersfield, California, as a switchman on April 10, 1973. He attended classroom instruction from April 23 to April 28, and was assigned to a yard crew as a student from April 29 to May 6. After the on-the-job training, the

brakeman was given some additional classroom instruction. He made several more trips as a student brakeman and on May 18 started work as a switchman at Bakersfield Yard. On May 30, he was transferred to Indio Yard as a road brakeman.

The flagman of train APW was hired as a switchman at Bakersfield on June 10, 1971. He worked as switchman until May 1973, when he was transferred to Indio Yard as a road brakeman. He had not received any training as a flagman or as a front brakeman before his transfer to Indio, and most of his student training concerned his duties as a switchman at Bakersfield Yard.

ANALYSIS

Crew of Train APW

At the time of the accident, the engineer had been active without rest for at least 23 hours. During his off-duty time in Yuma, the engineer consumed enough alcohol to cause associates to believe that he had been drinking.

If the engineer did not consume any alcohol during the 2-hour trip from Yuma to Indio, his body would have metabolized 0.016 percent blood alcohol per hour from the time he left Yuma until the time of the accident. Thus, when he registered for duty in Yuma, his blood alcohol level would have been 0.19 percent. Although clinical symptoms associated with such blood alcohol levels vary with individuals, there is little question that the engineer's condition was such as to impair his judgment. The lack of sleep for nearly 24 hours and the high temperature associated with the locomotive cab environment probably could have worsened the impairment produced by the alcohol.

The fact that train APW traversed the 14 miles between Iris and Wister at an average speed of more than 94 mph indicates that the engineer was not functioning normally. It was not possible to determine exactly the maximum speed of train APW in that stretch, but it probably was 100 mph, since lower speeds preceded and followed the 14 miles.

If the engineer's faculties were impaired by alcohol, this would explain his failure to stop train APW in accordance with the indication of signal 612.9 and his entry into Indio Yard at an excessive speed without seeing the rear of train GSX or the stop signal from the flagman. What is less understandable is why the other crewmembers, who were supposed to insure that failures would not result in an accident, did not perform their required functions. Appropriate backups did exist. The accident would not have occured if the backups had worked as intended.

The conductor did not discharge his responsibility at the beginning of the trip at Yuma as he did not question the engineer's impaired

physical condition. Although the conductor knew from the engineer's own admission and physical appearance that he was "tired", the conductor admonished the relatively inexperienced brakeman rather than the engineer to stay alert. This conduct raises the possibility that the conductor did not want to confront the engineer.

Although the brakeman had little experience and probably was not very familiar with the route, he should have been alert to the actions of the engineer. The brakeman should have recognized that the engineer was exceeding the speed limit as the train entered Indio Yard and he should then have operated the emergency brake valve.

Even if the brakeman had been confused by the flashing white light in conjunction with the stop aspect on signal 612.9 and assumed that it was all right for the train to pass it without stopping, he certainly should have seen the rear of the train GSX or the stop signal given by the flagman. Since there was no indication of an emergency brake application soon enough to reduce the speed before impact, it can be concluded that the brakeman was not alert as train APW approached the accident site.

The conductor expressed concern at Yuma about the engineer's ability to operate the train. That concern should have made the conductor aware of the significant violations of speed limits en route to Indio. First, the conductor should have been aware that the 60-mph restriction between Regina and Iris was being violated. Second, he should have known that the run from Iris to Wister was being made at a speed greatly exceeding the 70-mph authorized speed. The train graph and time of impact indicates that train APW traveled the 7.03 miles from the west switch at Thermal to the point of impact in 7 minutes. The 7.03 miles included speed restrictions of 50 mph for 6.08 miles and 30 mph for the 0.95 miles at Indio Yard. Thus, even if signal 612.9 had been green, the conductor should have called the engineer on the radio to determine if the engineer was physically capable of continuing on duty.

SP Operating Rules

The engineer's postmortem blood alcohol content of 0.16 percent is conclusive evidence that the engineer violated SP's Rule G, which prohibits the use of alcohol by employes subject to duty. This is true whether the engineer consumed the alcohol before or after he went on duty.

Although Rule G prohibits the use of alcohol, SP's procedures do not insure that an engineer or conductor will be in proper physical condition when he goes on duty. The SP should require a formal check of the crewmembers by the conductor before they go on duty. Consequently, the conductor would be less tempted to allow a crewmember who had been drinking to go on duty. The conductor, however, must be supported by rules and procedures which are consistently applied by management. These procedures

should include the conductor's acceptance of the entire crew as competent by signing a standard form before each trip.

Use of Locomotive Safety Devices

In 1973 the Safety Board issued reports on two accidents 2/ in which both the engineers and the front brakemen failed to observe stop signals and take the necessary action to avoid a head-on collision with another train. In each of those accidents, the locomotive was provided with a pedal-type dead-man control, which did not provide the required protection. In this accident, the dead-man control was cut out, and the brakeman did not provide the necessary redundancy to prevent the collision. The available evidence does not indicate that an operative dead-man control would have prevented the accident. However, the evidence does indicate the need for a device to control a train when an engineer fails to function properly.

Electronic devices currently available can monitor the movements of a locomotive engineer. If the engineer does not make the proper movements in a prescribed time, an alarm or brake application, or both, is initiated. If the lead locomotive unit of train AFW had been so equipped, the engineer or brakeman would have been alerted to the need for emergency braking. If they were incapable of taking action, the device would have applied the brakes.

When the engineer cut out the overspeed device without the knowledge of the crew on the caboose, he may have contributed to the failure of the conductor to recognize overspeed and take action. Since train AFW was permitted a maximum speed of 70 mph, the conductor might have assumed that the overspeed device would maintain the speed with only a slight overrun. A speedometer was not provided on the caboose, and the only method the conductor had to determine the speed was by timing the run between mileposts. Nevertheless, although he was not given adequate means to determine pertinent facts, the conductor was responsible for preventing overspeeds. If the conductor had been riding on the locomotive, he would have been in a better position to supervise the performance of the engineer.

The Board could not determine the extent to which the operating compartment environment contributed to this accident. The constant drone of the engines and the heat in the cab tend to lull an employe to sleep, even under the best conditions. Studies are being made of the design of locomotive cabs by the Federal Railroad Administration and the railroad industry; no definitive conclusions have yet been reached.

2/ Head-on Collision of Two Penn Central Freight Trains at Herndon, Pennsylvania, March 12, 1972, NTSB-RAR-73-3; Head-on Collision of Two Burlington Northern Freight Trains near Maquon, Illinois, NTSB-RAR-73-4.

Training of New Trainmen

Although the training given the crewmembers of train APW was typical of that found in the industry, it did not produce trainmen who possessed the self confidence and discipline necessary to carry out their duties without reliance on older employes. A new employe with limited understanding of train operation who has never used the emergency brake valve in actual operation is no match for an intoxicated engineer who is exceeding the speed limit. A few student trips do not develop the knowledge and confidence required to fulfill the position of front brakeman under the circumstances in this case. The brakeman apparently was not sufficiently aware of the importance of his position to keep him alert.

CONCLUSIONS

1. The engineer of train APW was under the influence of alcohol during the trip from Yuma to Indio Yard. Therefore, he was in violation of the SP operating rules.

2. Train APW exceeded the speed limit between Yuma and Indio, particularly between Clyde and Wister and between Thermal and the collision point.

3. The conductor of train APW did not exercise the authority vested in him to assure the safe operation of the train as required by operating rules G, 106, 843, 844, and 845.

4. The engineer of train APW did not dim his headlight as he passed the head end of Extra 9214 East as required by Rule 17-C. He did not operate the oscillating white light as he approached the grade crossing at Indio Yard as required by Rule 17.D.

5. SP procedures do not insure that employes are free from the influence of narcotics and intoxicants when they go on duty.

6. Both the overspeed device and the dead-man control on the lead locomotive unit of train APW were cut out without the conductor's knowledge. This was not in violation of any SP rules or instructions.

7. Federal regulations do not require dead-man controls or overspeed devices on locomotives.

8. Signals 613.9 and 612.9 properly displayed approach and stop indications, respectively, as train APW approached Indio Yard.

9. The engineer of train APW did not operate the train in compliance with the requirements of signals 613.9 and 612.9.

10. The front brakeman of train APW did not take action required by Rule 34 when the engineer passed signals 613.9 and 612.9 without complying with their indications.

11. The conductor and flagman of train APW could not discern the aspects of signals 613.9 and 612.9 before the locomotive passed them; however, they should have known the speed limits and recognized that the train was exceeding the maximum authorized speed for a clear signal on signal 612.9.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the crew of Extra 8992 West to stop their train, which was being operated at excessive speed by an engineer under the influence of alcohol. Contributing to this failure was the ineffectiveness of the Southern Pacific in assuring compliance with its operating rules and procedures, which were specifically designed to prevent an accident if a crewmember failed to perform his duties.

RECOMMENDATIONS

The National Transportation Safety Board recommends that:

1. The Federal Railroad Administration include in their proposed Standards for Rules Governing the Operation of Trains, regulations that will in effect prohibit the use of narcotics and intoxicants by employes for a specified period prior to their reporting for duty and while they are on duty. (Conclusions 1, 3, 5) (Recommendation R-74-9)

2. The Southern Pacific Transportation Company:

   (a) Establish more effective procedures to insure that employes comply with the operating rules such as by requiring that conductors examine crewmembers coming on duty to ascertain their apparent physical competence to perform their responsibilities. (Conclusions 1, 2, 3, 4, 5, 9, 10, 11) (Recommendation R-74-10)

   (b) Train all new employes including brakemen in their responsibilities and duties so that they understand their responsibility to monitor the performance of other employes and to take positive action when the situation warrants. (Conclusions 1, 2, 4, 9, 10) (Recommendation R-74-11)

   (c) Require the use of dead-man control, overspeed, and other safety devices on their locomotives and, if such devices

are inoperative, require that all members of the crew be so notified. (Conclusions 1, 2, 6) (Recommendation R-74-12)

The Safety Board reiterates the following recommendations made in the Board's report on the collision of two Penn Central freight trains at Herndon, Pennsylvania, on March 12, 1972:

1. The Federal Railroad Administration (FRA), in cooperation with the Association of American Railroads, develop a fail-safe device to stop a train in the event that the engineer becomes incapacitated by sickness or death, or falls asleep. Regulations should be promulgated to require installation, use, and maintenance of such a device. (Conclusions 1, 2, 3, 5, 6, 7, 9, 10, 11) (Recommendation No. R-73-8)

2. The FRA include in its present investigation of the safety of locomotive-control compartments a study of environmental conditions that could distract crews from their duties or cause them to fall asleep at the controls. Regulations should be promulgated to correct any undesirable conditions disclosed. (Conclusions 2, 4, 9, 10) (Recommendation R-73-9)

3. The FRA, in the promulgation of regulations governing railroad operating rules, where responsibility for safe operation of the train is assigned jointly to the engineer and the conductor, require that they be located and informed so that they can make quick, effective decisions. (Conclusion 1, 2, 3, 4, 6, 9, 10, 11) (Recommendation R-73-11)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

Francis H. McAdams, Member, was absent, and did not participate in the adoption of this report

March 20, 1974

APPENDIX

EXCERPTS FROM

SOUTHERN PACIFIC COMPANY

RULES AND REGULATIONS

OF THE

TRANSPORTATION DEPARTMENT

Effective January 1, 1969

The rules herein set forth govern the railroads operated by the Southern Pacific Company. They supersede all previous rules and instructions inconsistent therewith.

Special instructions may be issued by proper authority.

GENERAL RULES

A. Employes whose duties are prescribed by these rules must be provided with a copy.

Employes whose duties are in any way affected by the timetable must have a copy of the current timetable, and supplements if any, with them while on duty.

B. Employes must be conversant with and obey the rules and instructions. If in doubt as to their meaning, they must apply to proper authority for an explanation.

C. Employes must pass the required examinations.

E. Employes must render every assistance in their power in carrying out the rules and instructions and must report promptly to the proper official any violation thereof.

F. Accidents, defects in track, bridges or signals, or any unusual condition which may affect the movement of trains, must be promptly reported to the chief train dispatcher from first available point of communication.

G. The use of alcoholic beverages, intoxicants or narcotics by employes subject to duty, or their possession or use while on duty, is prohibited.

Employes shall not report for duty under the influence of any drug, medication or other substance, including those prescribed by a doctor or dentist, that will in any way adversely affect their alertness, coordination, reaction, response or safety; nor shall such drug, medication or other substance be used by employes while on duty.

DEFINITIONS

Absolute Signal. A home signal, the indications of which authorize and govern the movement of trains and engines and supersede the superiority of trains.

Approach Signal. A fixed signal used in connection with a home signal to govern the approach thereto. (For example, see Rule 285).

Automatic Block Signal System (ABS). A series of consecutive blocks governed by block signals actuated by a train, or by certain conditions affecting the use of a block.

Block. A length of track between consecutive home signals governing in one direction; or from a home signal to sign reading "End of Block" or "Block System Limit"; the use of which by trains is governed by block signal.

Block Signal. A fixed signal at the entrance of a block, or within a block, to govern trains entering and using that block.

Block System. A series of consecutive blocks within A-PB, ABS, CTC and interlockings.

Centralized Traffic Control (CTC). A method of operation by means of which the movement of trains over routes and through blocks on a designated section of track or tracks is directed by signals controlled from a designated point without requiring use of train orders and without regard to superiority of trains.

Home Signal. A fixed signal at the entrance of a route or block to govern trains entering and using that route or block.

Main Track. A track extending through yards and between stations, upon which trains are operated by timetable or train order, or both, or the use of which is governed by signal indication.

Signal Aspect. Appearance of a fixed signal conveying an indication as viewed from the direction of an approaching train.

Signal Indication. Information conveyed by the aspect of a fixed signal.

Single Track. Main track on which trains are operated in both directions.

Speeds:
Medium Speed. A speed not exceeding forty miles per hour.
Restricted Speed. Proceed prepared to stop short of train, obstruction, or switch not properly lined and look out for broken rail, not exceeding twenty miles per hour.
With caution. Run at reduced speed, according to conditions, prepared to stop short of a train, engine, car, misplaced switch, derail, or other obstruction, or before reaching a stop signal. Where circumstances require, train must be preceded by a flagman.

RULES
FOR
SINGLE AND DOUBLE TRACK

Rules will apply as follows:
Without prefix: Both single and double track.
Prefix "S": Single track only.
Prefix "D": Double track only.

10-J. Speed signs will be located to right of track in direction of approach where practicable. On double track where trains keep to left, speed signs will be located to left if proximity of adjacent main track prevents locating to right.

Speed signs that prescribe reduction in speed will be located three-fourths mile from initial point of restriction, and where used to authorize increase in speed will be located at point where higher speed commences. Speed may be increased as soon as rear of train has passed speed sign. Where such signs are not used to authorize an increase in speed, limit of restriction will be shown in timetable.

Fig. 1

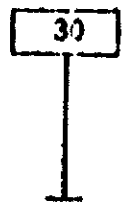


Fig. 2

The higher number on speed sign indicates the maximum speed for trains consisting entirely of passenger equipment, and the lower number indicates the maximum speed for all other trains. Where but one number is shown, it indicates the maximum speed for all trains.

Certain speed signs have the word "SIGNAL" above the figures. Such signs in advance of signal indicate the speed that must not be exceeded while engine is passing signal three-fourths mile beyond the speed sign, unless signal can plainly be seen to be displaying green aspect.

17-C. When rules require headlights to be displayed, electric headlights will be dimmed to front, except when nearing street or highway crossings, as follows:

When standing or running on yard tracks.

When approaching stations where other trains are standing.

On double track, when approaching stations, momentary blink, followed by dimming of headlight, as a signal to an opposing train that speed will be reduced, or stop made if necessary, to permit opposing train to receive or discharge traffic.

When passing head end and rear end of trains on adjacent track.

At other points to permit passing of signals, delivery of train orders, or when safety of employes requires.

17-D. Oscillating white light on engines so equipped must be operated during stormy weather day and night, foggy weather during daylight hours only and must be operated approaching road crossings at grade both day and night under all conditions.

Oscillating red light on engines so equipped shall be operated by day or by night only when train has stopped, or is stopping under circumstances that may cause an adjacent track to be fouled, and will not in any way relieve trainmen or enginmen from compliance with Rules 99, 102 and other rules. A train or engine on the same or adjacent track must stop at once, and may proceed only after ascertaining that track is safe for passage of trains.

34. When practicable, each member of crew must identify by name and communicate to each other each signal affecting movement of his train as soon as it becomes visible or audible to him.

If engineer fails to take proper action, other crew members on engine must remind him of rule requirement.

93. Within yard limits engines, after complying with provisions of Rule 81 or Rule 513, may use main track without train-order authority, clearing or protecting against first-class trains, and without flag protection against second and inferior-class trains, extra trains and engines.

Second and inferior-class trains, extra trains and engines must move with caution on main track within yard limits, except where movements are governed by block signal indication.

Trains and engines must not move against the current of traffic within yard limits until provision has been made for protection of movement, except where movement is within interlocking limits and protection is afforded by interlocking signals.

99-A. When rear of train is standing within yard limits, flag protection to the rear is not required against second and inferior-class trains, extra trains and engines.

When a train stops within block system limits, with protection of at least two block signals to the rear, flagman must go back immediately with flagman's signals a sufficient distance to insure full protection against following trains moving at restricted speed, except when rear of train is standing between opposing absolute signals at a station, or is within interlocking limits, flag protection to the rear is not required.

106. The conductor and the engineer, and pilot if any, are responsible for the safety of the train and observance of the rules, and, under conditions not provided for by the rules, must take every precaution for protection.

This does not relieve other employes of their responsibility under the rules.

BLOCK SIGNAL AND INTERLOCKING RULES

RULES GOVERNING THE MOVEMENT OF TRAINS AND ENGINES IN THE SAME DIRECTION BY BLOCK SIGNALS

D-251. On portions of the railroad on designated tracks as specified in the timetable, trains will run with reference to other trains in the same direction by block signals whose indications will supersede the superiority of trains.

D-253. Train dispatcher must be informed in advance of any known condition that will delay the train or prevent it from making usual speed.

D-254. Except as affected by Rule D-251 all block signal rules and other rules remain in force.

FIXED SIGNALS

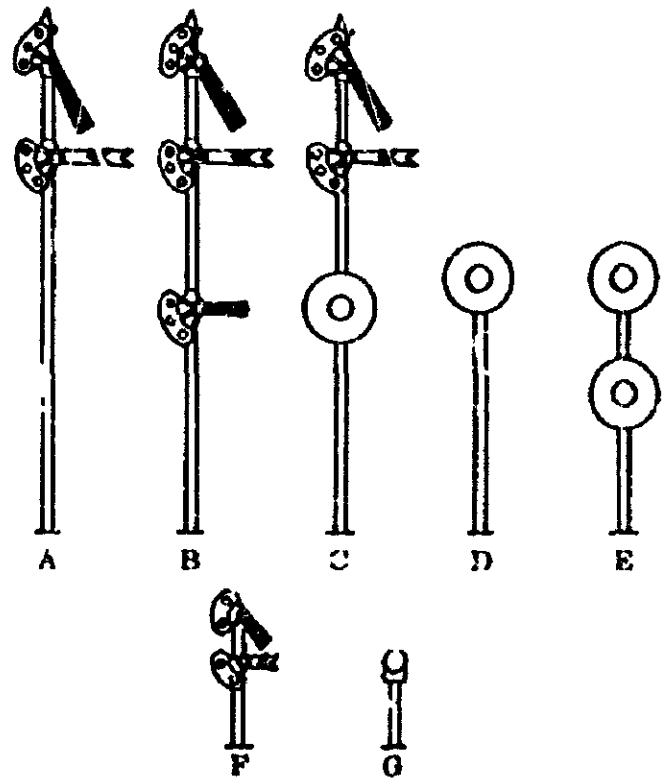
Automatic block signals will bear number plates attached to signal masts. Number plate on distant signal will bear prefix "D".

Interlocking signals will not bear number plates, but may have plates bearing letters "SA".

Absolute signals will not bear number plates, but will have plates bearing letters "A" or "SA".

Aspects as illustrated or referred to in these rules are shown by the position of semaphore arms or color of lights, or both, as seen from an approaching train. Other combinations may be used.

RULE 285.



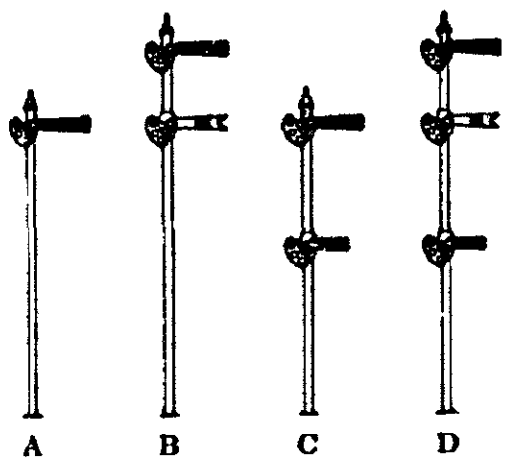
Indication: PROCEED NOT EXCEEDING MEDIUM SPEED, PREPARED TO STOP SHORT OF NEXT HOME SIGNAL

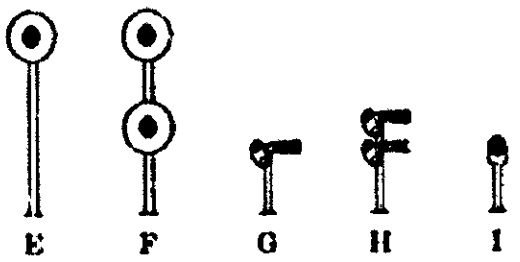
Name and Aspect: APPROACH SIGNAL YELLOW

Trains exceeding medium speed must reduce to medium speed before engine reaches the signal if advance view of the signal permits. After entering the block speed may be resumed provided next signal can be seen displaying proceed indication (green aspect).

Movements against the current of traffic or to non-signaled track governed by light-type signal displaying yellow aspect (Proceed not Exceeding Medium Speed), Figure D or G, must be made with caution and position of switches observed.

RULE 286.

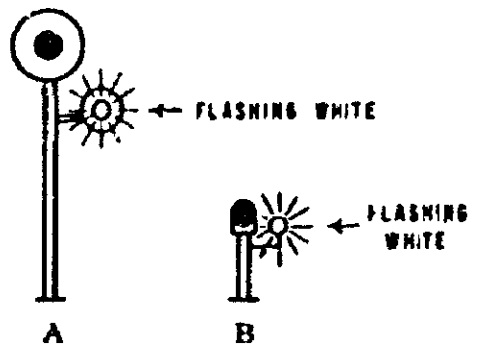




Indication: STOP

Name and Aspect: HOME SIGNAL RED

RULE 292.



Indication: STOP. WHEN FLASHING WHITE DISPLAYED BE GOVERNED BY SPECIAL INSTRUCTIONS

Name and Aspect: FLASHING WHITE

AUTOMATIC BLOCK SIGNAL SYSTEM

505. Automatic block signals govern the use of blocks, but unless otherwise provided, do not supersede the authority of trains; nor dispense with the use or the observance of other signals whenever and wherever they may be required.

D-506. Unless otherwise provided, block signals for a track apply only to trains moving with the current of traffic on that track.

507. When an automatic block signal displays stop indication, train, after stopping, may proceed at restricted speed. Under the following conditions train may proceed at restricted speed without stopping:

(a) To enter a siding where switch is not more than one thousand feet beyond the signal and it can be seen that no opposing train has passed the home signal governing such opposing train at opposite end of siding, or that an opposing or preceding train has stopped, or is moving prepared to stop clear of the route to be used.

(b) To enter a yard track when switch is lined for the receiving track and route is clear to fouling point of switch.

(c) To continue on main track when meeting or passing a train when view of track is clear to point where fouled by train which is taking siding, or when engineer is informed by member of the crew of train to be met or passed that stop indication of the signal is caused by train to be met or passed being partly in the siding and not clear of main track.

(d) To continue within limit of a grade signal.

(e) To permit an engine with, or without cars, to couple to its train.

When proceeding under provisions of Rule 507, restricted speed must not be exceeded until rear of train has passed out of the block or has passed a distant signal displaying green aspect.

810. Employes must report for duty at the prescribed time and place, remain at their post of duty, and devote themselves exclusively to their duties during their tour of duty. They must not absent themselves from their employment without proper authority. They must not engage in other business without permission of the proper officer.

An employe subject to call for duty must not absent himself from his usual calling place without notice to those required to call him.

Employes must not sleep while on duty. Lying down or assuming a reclining position, with eyes closed, or eyes covered or concealed, will be considered sleeping.

827. Speed of freight trains must not exceed eight miles per hour when starting from initial stations and intermediate stops, for the length of train, or until proceed signal is received from trainman.

Rolling inspection of running gear and brakes of as much of train as practicable must be made when starting from initial station and intermediate stops; and if necessary, stop signal must be given if wheels are found sliding.

Trainmen and enginemen must be in position to observe their train while running.

Unless otherwise provided, when conditions are favorable and in the judgment of conductor it is safe, freight trains need not stop for train inspection. Where stops are made for other reasons, inspection of trains must be made as often as practicable. When weather conditions restrict visibility, or other conditions require, conductor will designate stops for inspection which in his judgment are necessary.

Inspection should include running gear, bearings, brake and draft rigging. If defects are discovered they should be corrected if possible, and cars unsafe to run must be set out and chief train dispatcher notified. Special attention must be given to hot bearings.

843. The general direction and [illegible]nment of a train is vested in the conductor, and [illegible]er persons employed on the train must obey his instructions. Should there be any doubt as to authority or safety of proceeding, he will consult with the engineer, who will be responsible with him for the safety and proper handling of the train and such use of signals and other precautions as circumstances may require. Conductor must obey instructions of yardmasters within yard limits and be governed by direction of agents in doing work at stations, and conform to instructions issued by the Traffic and Accounting Departments.

When conductor is not present, trainmen must promptly obey instructions of engineer relating to rules, safety and protection of train.

844. Before leaving initial station, conductor must be assured that all crew members are available, hand brakes are released, and train is provided with proper tools, supplies and flagging equipment.

845. Conductors must assure themselves that their subordinates are competent and instruct them if necessary in the proper performance of their duties. Incompetence and disobedience must be reported.

871. Engineers must assure themselves that subordinate employes on engines are competent and instruct them if necessary in the performance of their duties. Incompetence and disobedience must be reported.