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RAILROAD ACCIDENT INVESTIGATION

REPORT NO. 4167

PENN CENTRAL COMPANY

ASHTABULA, OHIO

SEPTEMBER 23, 1968



FEDERAL RAILROAD ADMINISTRATION

BUREAU OF RAILROAD SAFETY

Washington, D C 20590

Summary

DATE: September 23, 1968

RAILROAD: Penn Central

LOCATION: Ashtabula, Ohio

KIND OF ACCIDENT: Derailment

TRAIN INVOLVED: Freight

TRAIN NUMBER: Extra 1699 North

LOCOMOTIVE NUMBERS: PC 1699, B&M 1710, PC 7447,
B&M 1735, PC 2537

CONSIST: 93 cars, cabooses

SPEED: 61 m p h

OPERATION: Signal indications

TRACKS: Double; 8°18' curve; 1.08
percent descending grade
northward

WEATHER: Clear

TIME: 4:00 p m

CASUALTIES: 7 injured

CAUSE: Excessive speed on a curve, re-
sulting from train moving out
of control due to inoperative
condition of the train brake
system caused by closed angle
cocks

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RAILROAD ACCIDENT INVESTIGATION,
REPORT NO 4167.

PENN CENTRAL COMPANY
SEPTEMBER 23, 1968

Synopsis

On September 23, 1968, a Penn Central freight train derailed while moving on a curve at Ashtabula, Ohio, resulting in injury to five train employees and two maintenance-of-way employees

The accident was caused by excessive speed on a curve, resulting from train moving out of control due to inoperative condition of the train brake system caused by closed angle cocks

Location and Method of Operation

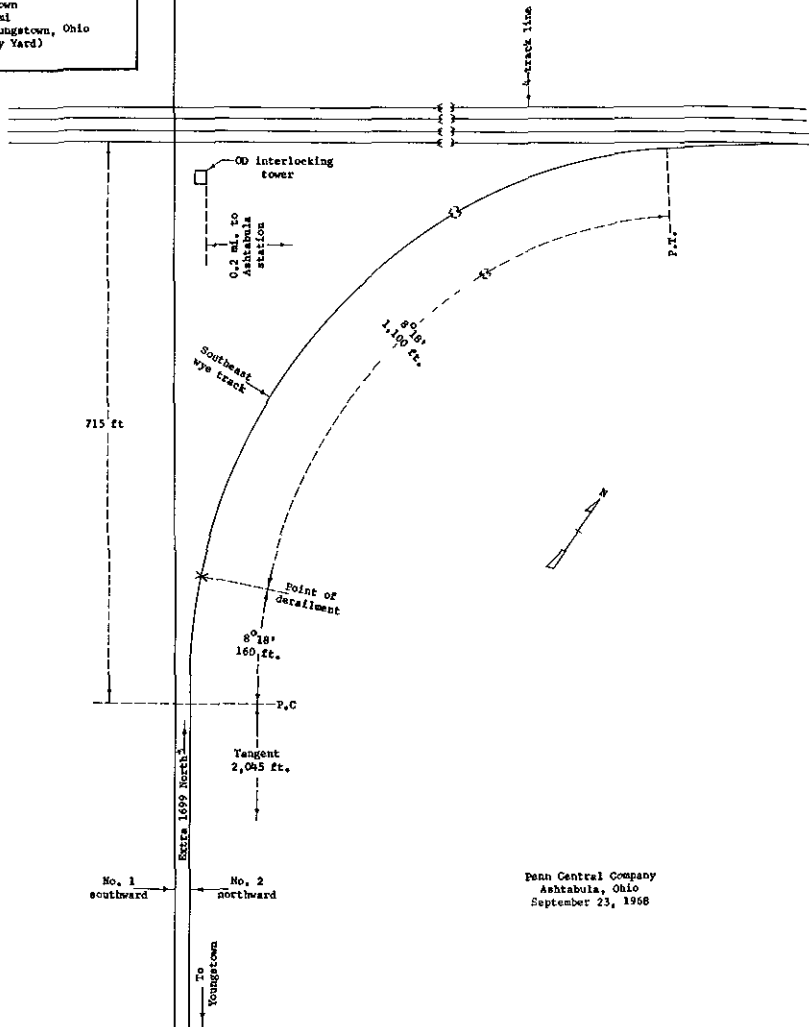
The accident occurred on that part of the Penn Central extending northward from Youngstown to Ashtabula, Ohio, a distance of 58.3 miles. In the accident area this is a double-track line over which trains moving with the current of traffic operate by signal indications of an automatic block-signal system. From the east, the main tracks are designated as No. 2 northward and No. 1 southward.

At OD Interlocking, 0.2 miles south of Ashtabula, track No. 1 is crossed at grade and right angles by a Penn Central 4-track line. Beginning about 715 feet south of the crossing track No. 2 curves northeastward to a connection with the 4-track line. This curved portion of track No. 2 is known as the southeast wye track.

The derailment occurred on the southeast wye track, approximately 160 feet beyond the point where that track begins to curve northeastward to the 4-track line.

- Ashtabula, Ohio
0.2 mi
- OD Interlocking
0.1 mi.
- × Point of derailment
4.2 mi.
- Caron
53.1 mi.
- Valley Street Interlocking
0.7 mi.
- Youngtown
2.8 mi
- East Youngtown, Ohio
(Gateway Yard)

Ashtabula



Penn Central Company
Ashtabula, Ohio
September 23, 1968

Time and Weather

The derailment took place at 4:00 p m , in clear weather

Track and Grade

From the south on track No 2 and the southeast wye track, there are several tangents and curves throughout a considerable distance, followed by a tangent 2045 feet long, and an 8°18' curve to the right approximately 160 feet to the derailment point and 1,100 feet northeastward

The grade for northbound trains is, successively, 0 30% ascending approximately 0 7 mile, and an average of 1 08% descending 4 3 miles to the derailment point

The track structure in the derailment area consists of 127-pound rail, 39 feet in length, relaid in 1965 on an average of 24 ties per rail length It is fully tieplated with double-shoulder tie plates, spiked with two rail-holding and two plate-holding spikes, and is provided with 6-hole, 36-inch joint bars and about 16 rail anchors per rail It is ballasted with crushed limestone to a depth of 12 inches below the ties

Authorized Train Speed

The maximum authorized speed for mineral trains in the territory involved is 40 m p h It is restricted, however, to 15 m p h in the derailment area

Car Angle Cocks and Locomotive End and Cutout Cocks

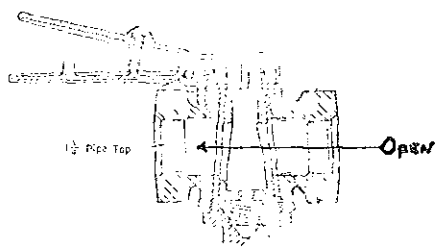
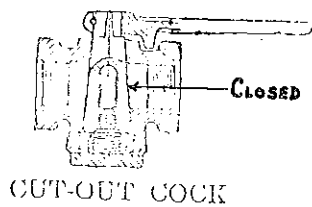
These cocks are manually-operated valves used to open or close the flow of air between the brake pipe and air hose at the ends of cars or locomotives All such cocks involved in the accident will hereinafter be referred to as angle cocks

Train Equipment

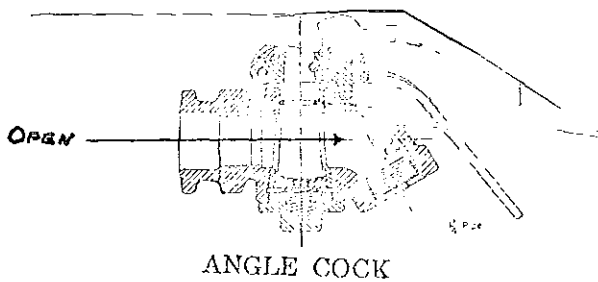
The derailed train was Extra 1699 North, a northbound mineral train

From the front, the locomotive consisted of diesel-electric units PC 1699 (EMD F-7), B&M 1710 (EMD GP-9), PC 7447 (EMD GP-9), B&M 1735 (EMD GP-9), and PC 2537 (GE U-25) The first unit was of the car-body type The others were of the road-switcher type The first locomotive unit had 24 RL air brake equipment Since it had no dynamic brake apparatus, such apparatus on following units was inoperative The fifth locomotive unit was equipped with a speed-recording device and tape In addition to speed, the tape recorded applications of the brakes on the fifth locomotive unit

In addition to the locomotive units, the train consisted of 93 hopper cars loaded with coal and a caboose (11,160 tons) The cars were new, having been first placed in ser-



BRAKE PIPE END COCK



vice about six months before the accident. They had ABD air brake equipment, composition brake shoes, and roller bearings.

Circumstances Prior to Accident

Gateway Yard at East Youngstown, 3.8 miles south of Youngstown, is a joint facility of the Penn Central and the Pittsburgh and Lake Erie Railroad. It is operated by the latter carrier.

At 4:35 a.m., the day of the accident, a 123-car P&LE freight train arrived at Gateway Yard, its final terminal, and was stopped on yard track No. 5 by use of the automatic brakes. P&LE yard forces subsequently removed the first 9 and last 21 cars from that train. The remaining 93 cars were destined for interchange to a northbound Penn Central train.

About 5:10 a.m., P&LE car inspectors were instructed to inspect the cut of 93 cars on track No. 5 and to test its air brake system. The car inspectors subsequently reported to their foreman that the air brake test could not be accomplished, due to a car at the north end of the 93 cars obstructing a yard plant air-test outlet located between the rails of track No. 5. As a result, the foreman instructed the car inspectors to continue with their inspection of the cars, but to omit the air brake test. After closing the angle cock at each end of the cut of 93 cars, they proceeded to inspect the cars. According to their statements, the car inspectors noticed during their inspection that all the other angle cocks of the cars were in open position; that the brake pipe pressure was fully depleted, and that the brake-cylinder pistons of all the cars were extended.

Some time before 10:45 a.m., P&LE mechanical department employees at the Gateway Yard engine terminal assembled diesel-electric units 1699, B&M 1710, 7447, B&M 1735, and 2537, in that order, for use as the locomotive of Penn Central train Extra 1699 North. They stated that after preparing the diesel-electric units for multiple-unit control from the control compartment of the leading unit, the independent and automatic brake systems of the locomotive were tested and were found to be functioning properly. The investigation, however, revealed Extra 1699 North apparently left Gateway Yard with some of the locomotive controls not in correct position for proper control of the locomotive air brake system. This matter will be discussed in detail later in our report.

About 10:45 a.m., the PC engineer and fireman assigned to the locomotive of Extra 1699 North reported on duty at the Gateway Yard engine terminal. According to their statements, they also tested the locomotive brakes and found them to be operating properly.

At 11:15 a.m., the locomotive was coupled to the north end of the 93 cars on yard track No. 5. The air hoses be-

tween the locomotive and first car were also coupled and the associated angle cocks moved to open position. About the same time, a P&E yard locomotive shoved the train caboose, with air, to a coupling with the south end of the cars. The air hoses at the front of the caboose and the rear end of the cut of 93 cars were then coupled, and the associated angle cocks were moved to open position. When this was done, the yard locomotive began to charge the train brake system. Approximately five minutes later, the angle cocks at the rear of the caboose and the front of the yard locomotive were closed, after which the yard locomotive moved away from the caboose.

The flagman stated that about 15 minutes after the train was assembled he saw that the caboose air gage was indicating 75 pounds brake pipe pressure. He said he then asked the conductor of the yard locomotive to radio the train engineer and request him to apply and release the air brakes of the train before leaving Gateway Yard. The engineer said he responded to the request by reducing brake pipe pressure 12 pounds; making a test which revealed no leakage from the train air brake system; reducing brake pipe pressure an additional 15 pounds, and by releasing the brakes soon afterward. The flagman said that the caboose air gage showed a reduction in brake pipe pressure, and that he saw the caboose brakes were applied. He said the caboose brakes released a short time later, and the caboose gage indicated 75 pounds brake pipe pressure soon afterward. The conductor said he saw air brakes on cars at the rear of the train apply and release before leaving Gateway Yard.

Extra 1699 North, consisting of 5 diesel-electric units, 93 cars and a caboose, left Gateway Yard at 11:40 a.m., without its brakes having been tested in accordance with requirements of the Power Brake Law of 1958. About 25 minutes later, the engineer stopped the train by use of the independent (locomotive) brake at Valley Street Interlocking, 4.5 miles north of East Youngstown, in an area where stopped trains have reportedly experienced trouble with trespassers maliciously closing angle cocks of cars. Extra 1699 North remained stopped and intact at Valley Street Interlocking until 2:05 p.m., when it resumed its trip northward.

Approximately 45 minutes later, while the train was moving about 40 m.p.h. in an area approximately 26 miles north of East Youngstown, the front brakeman saw that the brakes of the 11th car were sticking. The engineer stated he thereafter stopped the train on a practically level grade by applications of the automatic and independent brakes over a considerable distance. The engineer's statements indicate he noticed nothing unusual concerning the operation of the brakes while making this stop. Neither the conductor nor the flagman noticed whether the brakes at the rear of the train had applied. The conductor, however, said the caboose air gage showed more than 70 pounds brake pipe pressure at that time, indicating the service application of the automatic brakes initiated by the engineer had not appreciably reduced brake pipe pressure throughout the train. About 10 minutes after stopping, when the front

brakeman had released the brakes of the 11th car and returned to the first diesel-electric unit, the train resumed its trip northward

Extra 1699 North was moving at 44 m p h , on a 0 30% descending grade, when it reached a point about 10 miles south of OD Interlocking, Ashtabula About that time, the engineer used the automatic brake valve twice for service reductions of brake pipe pressure totaling about 20 pounds, and bailed off the independent brake valve to keep the locomotive brakes from applying On each occasion, according to his statements, he heard a short exhaust of air from the automatic brake valve After the train moved a mile or two farther northward, the engineer realized his operation of the automatic brake valve was ineffective in controlling the speed on the descending grade He then placed that valve in emergency position and the independent brake valve in fully applied position A few moments later, as indicated by information developed in the investigation, he apparently bailed off the application of the automatic brakes on the locomotive, while maintaining the application of the independent brake Shortly thereafter, he realized that his train was not reducing speed as it should and that it was moving out of control

As Extra 1699 North moved out of control on the descending grade, in an area six to eight miles from the derailment point, it passed a southbound freight train moving on the adjacent main track Soon afterward, while moving at 38 m p h , it passed a yard locomotive in the yard at Carson, about 5 miles south of the derailment point The Carson yard area is in a 20 m p h speed restriction zone and on a level grade Crew members of both the southbound freight train and yard locomotive saw smoke, caused by braking action, under the locomotive and about the first 10 cars of Extra 1699 North They were unaware that the train was moving out of control Consequently, when its rear end passed, they gave no warning signal to the crew members on the caboose

Immediately after passing Carson, Extra 1699 North entered a 0 30% ascending grade, about 0 7 mile in length, while moving at 34 m p h , and the engineer, fireman and front brakeman jumped from the locomotive When the caboose passed him, the engineer tried to attract the attention of the conductor and flagman, but was unsuccessful Soon afterward, the train moved over the summit of the ascending grade and onto the grade averaging 1 08% descending 4 3 miles to the derailment point The speed had decreased to 28 m p h at the summit The conductor said he observed that the caboose air gage was indicating 70 pounds brake pipe pressure as the train neared the summit, and both he and the flagman felt concern at that time about the speed Some time after the train moved over the summit and increased speed considerably on the descending grade, the flagman initiated an emergency brake application by operating the conductor's brake valve on the caboose

The train, however, continued to increase speed on the descending grade And, its speed was 61 m p.h , as indi-

cated by the speed-recording tape, when it reached OD Interlocking and the southeast wye track at that interlocking. Immediately after the train entered the southeast wye track, which has an 8°18' curvature to the right, the locomotive units derailed and overturned to the left because of excessive speed on the curve, and the first 66 cars also derailed

Casualties

Engineer	-	Laceration of left middle finger
Fireman	-	Cerebral concussion; compound fracture of vertebral column; multiple contusions, abrasions and lacerations
Front Brakeman	-	Cerebral concussion; fractured wrist; multiple contusions, abrasions and lacerations
Conductor	-	Sprained back
Flagman	-	Multiple body contusions

In addition, two maintenance-of-way employees walking near the southeast wye track were bruised or lacerated slightly when struck by equipment of the derailed train

Damages

Beginning at the point where it begins to curve north-eastward to the 4-track line, the southeast wye track structure was destroyed throughout a distance of about 700 feet

The train stopped with the front end about 600 feet beyond the derailment point. All five diesel-electric units and the first 66 cars were derailed. The diesel-electric units overturned onto their left sides. The derailed cars stopped in various positions to the rear of the diesel-electric units.

An intense fire resulted when oil from punctured fuel tanks on the locomotive was ignited. As a result of the derailment and fire, the five diesel-electric units were destroyed. Of the 66 derailed cars, 65 were destroyed or heavily damaged, and one was slightly damaged.

According to the carrier's estimate, the cost of damages to the track structure, and train and signal equipment, was \$1,854,200.

Post-Accident Examination of Train Equipment

Examination of the controls of the leading diesel-electric unit 1699 found the automatic brake valve in emergency position; the independent brake valve in full application position; the rotair valve in passenger posi-

tion; brake pipe cut-out cock in cut-in position; the throttle in idle position; the reverser handle in neutral position and the fireman's emergency brake valve in closed position. When tested later, the feed valve was found to be set for 83 pounds brake pipe pressure. Controls, valves, cocks, etc. of the trailing units were in proper position, except for the following:

1. The MU-2-A valve on the fifth unit, 2537, was found in "Lead or Dead" position. With the valve in this position, the independent brake of unit 2537 could not have been applied through operation of the independent brake valve on the first unit.
2. The independent application and release pipe cut-out cock at the front of the fourth unit, B&M 1735, was found in partially open position. Abrasion marks indicated that the cock had moved from closed position as a result of the derailment. With the cock in closed position, the independent brakes of the fourth unit, B&M 1735, and the fifth unit, 2537, could not have been applied through operation of the independent brake valve on the first unit. However, since all cocks in the actuating pipe were found open, an automatic brake application on all locomotive units could be released by bailing off the independent brake valve.
3. The angle cock at the front of the fourth diesel-electric unit, B&M 1735, was of the non-locking type. It was broken off from the brake pipe at the threads, and was found with the handle at a 45-degree angle or in partially open position. No determination could be made as to whether the handle was in the 45-degree position, or in fully open or closed position, before the accident. If it was in fully closed position, the engineer would have had no control over the automatic brakes to the rear of the third locomotive unit. If it was in partially open position as described above, and all other angle cocks between the locomotive units and cars were in open position, the engineer (a) probably could have made a service application of the automatic brakes on all the locomotive units and the cars, and (b) probably could not have applied the automatic brakes of the last two locomotive units and the cars in emergency, due to the rate of air flow through the brake pipe being restricted by the partially open angle cock.
4. The speed-recording tape of the fifth locomotive unit bore marks which indicated the engineer had initiated service brake applications en route from Gateway Yard, as alleged, and that after initiating an emergency brake application when the train was about eight miles from the derailment point he bailed off the application of the automatic brakes of the locomotive.

Examination of the cars revealed the following information relative to their angle cocks:

1st car - both angle cocks missing
 3rd car - " " " "

were so designed that they were in closed positions when their handles were in line with the brake pipe. The angle cocks of the other three units were in open positions when their handles were in line with the brake pipe. While the machinist's statements seemingly indicate the angle cocks of the second and fourth units were in closed positions when the enginemen of Extra 1699 North took over the locomotive at Gateway Yard, information developed in the investigation indicates they had been moved to open, or proper, positions. Statements of both the machinist and assistant general foreman indicate they were unaware that some locomotive angle cocks were designed to be in closed position when their handles were in line with the brake pipe.

Sometime after the locomotive was assembled, according to their statements, the foreman and machinist tested its independent and automatic brakes. The machinist stated that the brakes of all the locomotive units functioned properly when tested. The independent brakes of the fourth and fifth units, however, could not have functioned properly, due to controls on those units having been left in improper positions. If the angle cocks of the second and fourth units were closed, as indicated by other statements of the machinist, the automatic air brakes of the second, third, fourth and fifth units could not have functioned during the locomotive brake test.

Train Brake Tests-Gateway Yard

According to statements of railroad personnel, it was common practice for trains to leave Gateway Yard without having had their brakes tested in accordance with applicable provisions of the Power Brake Law of 1958.

Train Crew's Hours of Service

All the crew members had been on duty 5 hours 45 minutes at the time of the derailment, after having been off duty more than 45 hours.

Train Enginemen

The engineer, age 46, was first employed by the carrier as a locomotive fireman in June 1941, and was promoted to engineer in July 1948. His record for the 15-year period preceding the derailment contained no information reflecting improper operation of locomotives and/or trains. The record indicates he had not attended an air brake instruction class subsequent to his promotion to engineer, or a book-of-rules class since April 1957.

The fireman, age 57, was first employed by the carrier as a fireman in June 1943 and was promoted to engineer in June 1953. His record, relating to the operation of locomotives and trains, was clear. It also indicated he had not attended an air brake instruction class after his promotion to engineer, or a book-of-rules class since April 1957.

Findings

1 After assembling the locomotive of Extra 1699 North, P&LE mechanical department personnel placed or left controls of the fourth and fifth units in improper positions for operation of the locomotive in multiple-unit control. As a result, the independent brakes of the fourth and fifth units were not operative from the independent brake valve of the first unit.

2 Although statements made by the P&LE machinist involved imply that the angle cocks of the second and fourth locomotive units had been left in closed, or improper, positions, the evidence indicates otherwise. We conclude therefore the angle cocks of the second and fourth units were in open positions and did not adversely affect the automatic brake system.

3 The inoperative condition of the independent brakes on the fourth and fifth locomotive units were undetected due to failure of P&LE mechanical department personnel to make an adequate test of the locomotive brakes, and failure of the PC enginemen to conduct the tests necessary to know that all the locomotive brakes were operative, as required by the Power Brake Law of 1958.

4 Failure of the PC enginemen to comply with the Power Brake Law appears to have been a significant causal factor in the accident, as there is a strong possibility that had the inoperative condition of the independent brakes on the last two locomotive units been detected and corrected by the enginemen, the additional braking forces provided by those brakes would have been sufficient to either (a) stop the train short of the descending grade on which the derailment occurred, or (b) reduced the speed short of the aforesaid descending grade to the extent that the train would have entered the descending grade at very slow speed and would not thereafter have been able to increase speed significantly on the descending grade.

5 Due to lack of proper or adequate supervision, it was common practice for trains to leave Gateway Yard without undergoing the prescribed brake tests. Following this practice, Extra 1699 North left Gateway Yard without its brakes having been tested in accordance with the Power Brake Law of 1958. The train brakes, however, were apparently tested to some extent and the test revealed nothing which would indicate there was a problem with the engineer's control of the automatic brake system.

6 In the absence of any information to indicate otherwise, we find that the train left Gateway Yard in good condition except for the inoperative independent brakes on the last two locomotive units.

7 After the train stopped at Valley Street Interlocking, apparently one or more unknown persons maliciously closed angle cocks on the 11th car, the 59th car, and on some intervening

cars It is not known whether the closed angle cocks were at the front or rear of the cars With angle cocks closed on the aforesaid cars, the brakes of the train to the rear of the 10th or 11th car were not operative from the engineer's automatic brake valve, and the brakes of the train ahead of the 59th or 60th car were not operative from the conductor's brake valve in the caboose The primary causal factor in the accident was the malicious closing of angle cocks This prevented the engineer from applying the brakes of the train behind the first closed angle cock to the rear of the locomotive

8 Due to the train equipment being relatively new, there was little or no leakage from the brake system after the angle cocks mentioned above were maliciously closed Thus, the train brake pipe remained charged; the automatic brakes remained released; the air gages on the locomotive and caboose reflected nothing unusual to warn the crew, and the train was enabled to leave Valley Street Interlocking

9 Considering that most of the automatic brake system had been rendered inoperative by the closed angle cocks, it would appear the engineer should have realized something was wrong with that system when he brought the train to a stop as a result of the sticking brakes on the 11th car Had he recognized something unusual about the operation or effectiveness of the train brake system at that time, the accident might have been averted It is noted here that the engineer had not attended an air-brake instruction class for about twenty years and therefore may have been lacking in adequate training Hence, a contributing factor in the accident may have been the PC's failure to take the action necessary to ensure the engineer was thoroughly familiar with the characteristics of various types of air brake equipment and thoroughly skilled in train handling

10. About ten miles from OD Interlocking, the engineer manipulated his automatic brake valve to control the speed of the train on a 0 30% descending grade, and he bailed off the independent brake valve to release the application of the automatic brakes on the locomotive As a result of his actions, and the closed angle cocks which prevented propagation of the brake application, only the brakes of the first ten or eleven cars applied and their braking effort was insufficient to reduce the speed of the train on the grade

11 About eight miles from OD Interlocking, as the train continued to move on the 0 30% descending grade at 44 m p h, the engineer realized something was wrong He then sought to stop the train by moving the automatic brake valve to emergency position, and moving the independent brake valve to fully applied position while simultaneously bailing off the application of the automatic brakes on the locomotive This resulted in the brakes of the first 10 or 11 cars becoming applied in emergency, release of the automatic brakes on the locomotive, and the independent brakes of the first three locomotive units becoming heavily applied The independent brakes of the last two units did not apply due to improperly positioned locomotive controls

12 The braking effort provided by the independent brakes of the first three locomotive units and the automatic brakes of the first 10 or 11 cars was insufficient to stop the train on the 0 30% descending grade. However, it prevented the train from increasing speed and eventually reduced the speed to 38 m p h , when the train passed Carson while moving on level grade in a 20 m p h speed-restriction zone.

13 The conductor and flagman were unaware that the train was moving out of control, and took no exception to its speed through the speed-restriction zone at Carson. Had either taken exception to the speed and taken prompt action to apply the brakes by operating the caboose brake valve, the brakes of that part of the train to the rear of the closed angle cock on the 59th car would have applied and the train probably would have stopped on the short ascending grade located just north of Carson. Thus, the accident would have been averted.

14 As the train decreased speed further on the short 0 30% ascending grade north of Carson, both engineers and the front brakeman jumped from the locomotive. The crew members in the caboose were unaware that the train was moving out of control and that the locomotive was abandoned.

15 The application of the independent brakes on the first three locomotive units and the automatic brakes of the first 10 or 11 cars caused the train to reduce speed to 28 m p h by the time it moved over the summit of the short ascending grade and onto the 1 08% descending grade extending 4 3 miles to OD Interlocking.

16 After the train increased speed considerably on the 1 08% descending grade, the crew members on the caboose recognized something was amiss and initiated an emergency application of the brakes by use of the caboose brake valve. As a result, the brakes of the caboose and the last 34 or 35 cars in the train became applied in emergency. Further propagation of the brake application was prevented by the closed angle cock on the 59th car.

17 The total braking effort resulting from the application of the independent brakes on the first three locomotive units, the automatic brakes of the first 10 or 11 cars and the last 34 or 35 cars, and of the caboose, was insufficient to curtail the speed of the train on the descending grade. As a result, the train continued to increase speed on the grade, entered the curve involved at 61 m p h and the locomotive units overturned because of excessive speed, causing the general derailment.

18 Since post-accident examination of the cars found evidence of heavy braking action on wheels and brake shoes of only the first two cars, a possibility exists that the angle cock at the front of the third car was maliciously closed at Valley Street Interlocking. If such was the case, the engineer's manipulation of the automatic brake valve while approaching OD Interlocking resulted in application

of the brakes on the first two cars, rather than the first 10 or 11 cars. This matter cannot be determined due to lack of sufficient evidence and available information being conflicting.

Dated at Washington, D C , this 23rd
day of June 1971
By the Federal Railroad Administration

Mac E. Rogers, Director
Bureau of Railroad Safety