# AILROAD - HIGHWAY ACCIDENT REPORT



BOSTON AND MAINE CORPORATION
SINGLE DIESEL-POWERED PASSENGER CAR 563
COLLISION WITH OXBOW TRANSPORT COMPANY TANK TRUCK
AT SECOND STREET RAILROAD-HIGHWAY GRADE CROSSING
EVERETT, MASSACHUSETTS
DECEMBER 28, 1966,

RELEASED: MAR 7 1968

U.S. NATIONAL TRANSPORTATION SAFETY BOARD.

Department of Transportation

Washington, D. C. 20591

# FOREWORD

This proceeding was instituted by the Interstate Commerce Commission pursuant to provisions of the Accident Reports Act, and hearings were held at Everett, Massachusetts, on January 11-13, 18-20 inclusive, 1967. As authorized by the Accident Reports Act, the Massachusetts Department of Public Utilities participated in this investigation.

The Department of Transportation Act, 80 Stat. 931, became effective on April 1, 1967. Under its provisions, it became the duty of the National Transportation Safety Board (Board) to determine the cause or probable cause of the railroad accident involved in the proceeding, to report the facts, and to make recommendations to prevent the recurrence of similar accidents. The Department of Transportation Act further provides that the Board shall make public its accident reports and recommendations. The Board's report of the facts, conditions and circumstances of this accident and its determination of cause or probable cause is subject to the limitation that such report, or any part thereof, shall not be admitted in evidence or used for any purpose in any suit or action for damages, as provided by Section 4 of the Accident Reports Act, 45 U.S.C. 41.

NATIONAL TRANSPORTATION SAFETY BOARD
DEPARTMENT OF TRANSPORTATION
WASHINGTON, D. C.

# Boston and Maine Corporation
# Second Street Grade Crossing
# Everett, Massachusetts
# December 28, 1966

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## SYNOPSIS

At 12:10 a.m. on December 28, 1966, eastbound first-class passenger train No. 563 consisting of a single car diesel-powered passenger unit operated by the Boston and Maine Corporation, collided with a northbound motor tank truck owned and operated by the Oxbow Transport Corporation of Lexington, Massachusetts, stopped across the Second Street railroad-highway grade crossing at Everett, Massachusetts. The collision resulted in the death of 11 of a total of 28 passengers and 2 of the 3 train crew members, and other injuries and damage to property. The semitrailer of the tank truck containing 8,300 gallons of fuel oil ruptured on impact covering the forward end of the single railroad passenger car with the flammable oil. Low-order explosions and a rapid spread of flames immediately covered the forward section of the car. The fatalities were due to thermal burns and smoke inhalation, rather than from collision injuries. The truck driver had left the vehicle prior to the collision and was not injured.

At 12:08 a.m. train 563, while moving at approximately 20 miles per hour, proceeded over a drawbridge located 1.6 miles west of the Second Street crossing in Everett, and continued eastward at accelerating speed. The train had attained a speed of 55 to 60 miles per hour when at a point approximately 900 feet west of the Second Street crossing, the train brakes were applied in emergency. Because of the brake application, the train's speed was reduced to some undetermined figure less than 50 miles per hour when it struck the truck.

The crossing is guarded by flashing red lights of the automatic railroad crossing-warning type and crossing gates. The warning signals were not in operation when the truck entered the crossing, but were actuated after the truck stopped across the tracks, and were in operation at the time of the collision.

There was extensive damage to both the train and the truck.

U. S. Weather Bureau records show that at 12:10 a.m. on December 28, 1966, the temperature in the accident area was 22°F, there was good visibility on a dark night, and there were about 4 inches of snow on the ground.

The Board determines that the probable cause of this accident was the loss of air pressure in the brake systems for the tractor and trailer which resulted in an automatic application of the brakes that could not be released from the cab of the tractor, and therefore held the tractor trailer directly across the Boston and Maine track at the collision point.

The Board further determines that the cause of most of the deaths and injuries was not the impact of the collision, but the lack of emergency exits in the car, in addition to the inward-opening center rear door that became jammed in a closed position by persons attempting to escape.

## LOCATION AND METHOD OF OPERATION

The accident occurred on that part of the Boston and Maine Corporation railroad extending between North Station, Boston, and Rockport, Massachusetts, a distance of 35.3 miles. This is a double-track line over which trains moving with the current of traffic operate by timetable, train orders and an automatic-block signal system. From the north the main tracks are designated as the inbound (westward) track and the outbound (eastward) track.

The collision occurred on the outbound track 3.9 miles east of North Station and within the city limits of Everett where the main tracks are crossed at grade by Second Street. Two tracks of the Boston and Albany Railroad parallel the Boston and Maine tracks on the south at the crossing, and form part of that crossing. The B&A track immediately south of the B&M tracks is out of service, and does not extend beyond the east and west sides of the crossing.

The crossing is protected by automatic gates and by standard automatic crossing-warning signals of the flashing red light type with bell. A crossing watchman shanty is in the southwest angle of the crossing. However, no watchman was on duty at the time of the accident.

From the west on the outbound track there are successively a long tangent, a 2-degree curve to the left 929 feet to a point in the southward highway lane of the crossing, and a tangent about 21 feet to the collision point and a considerable distance eastward. In this area the railroad grade is practically level.

Two large buildings are located in the northwest angle of the crossing. Because of the buildings, track curvature, and a pole line paralleling the B&M tracks on the north, the view between a highway vehicle standing on the outbound track at the crossing and an approaching eastbound train is restricted to about 1,208 feet (see Appendix No. II). The view between an approaching eastbound train and a person near the southern-most B&A track at the crossing is approximately 2,500 feet (see Appendix No. II).

Signal P-37, governing eastbound movements on the outbound track, is approximately 880 feet west of the Second Street crossing in Everett.

The Second Street railroad crossing was paved with bituminous material, and was in a deteriorated condition. The surface was uneven and had numerous pitted and depressed areas, particularly adjacent to the rails. Because of this, highway vehicles normally traveled the crossing at slow speeds, and bounced considerably while doing so. During the 30-day period immediately preceding the day of the accident, the average daily Boston and Maine movement over the crossing was 66 trains. A traffic count disclosed that in the 24-hour period, beginning 6:00 a.m. January 4, 1967, 6,797 highway vehicles including 1,565 motor trucks moved over the crossing. Of these vehicles, 3,346 traversed the crossing between 6:00 a.m. and 10:00 a.m., and between 6:00 p.m. and 6:00 a.m. A crossing watchman is stationed at the crossing from 10:00 a.m. to 6:00 p.m. weekdays for the purpose of eliminating delays to highway traffic when switching operations are being performed nearby. The watchman's shanty is equipped with a railroad party-line telephone.

Second Street crosses the B&A and B&M tracks at an angle of $37^{o}30'$. The crossing is about 47 feet wide between its curb lines. Planking is laid along each side of the rails throughout the width of the crossing. The distance between the outermost rails is 67 feet.

Details concerning the crossing-warning signals and signs, Boston and Maine Corporation operating rules, Massachusetts motor vehicle law and other factors are set forth in the appendix.

## DESCRIPTION AND DISCUSSION

The train involved was No. 563 consisting of B&M railway diesel car 6142, an all-steel unit designed for the transportation of passengers. Operating controls are located in the vestibules at each end of the unit. There is a safety control feature (dead-man) actuated by pressure on a pedal. If downward pressure on the pedal were released, an emergency-brake application would occur unless a service brake application of a predetermined pressure had been made. The unit had two 4-wheel trucks spaced 59 feet 6 inches between truck centers. Each truck was provided with disc brakes and antiwheel-slide devices. The unit was 85 feet long and 10 feet 5 inches wide. The vestibule at each end of the unit was 3 feet 6 inches wide with steps on each side. A trap door and a side door were provided for access to the steps. When these doors were closed, the trap door was secured in down position by a pedal latch. To gain access to the steps, it was necessary to open the side vestibule door, which was hinged to swing inward, unlock the trap door by depressing the pedal latch, then raise the trap door and latch it in open, or upright position against the open side door. A door was provided at the front of each vestibule, to provide access to another unit, if attached. A strong, vertical steel beam designated as a collision post, was on each side of this door.

A door 28 inches wide was provided at each vestibule for entrance to, or exit from, the passenger compartments. The door at the front, or east, end of the unit opened inward to a passageway at the front of the nonsmoking coach section. The passageway was 52½ inches long and about 33 inches wide. The nonsmoking coach section was 29 feet 5 inches long, and had a 40-passenger seating capacity. A bulkhead 21 inches wide separated the nonsmoking coach section from the smoking section. The latter section was 35 feet 5 inches long, and had a 49-passenger seating capacity. A passageway 33 inches wide was at the rear of the smoking section. The door at this location was hinged to swing inward and was the one that closed and trapped the passengers and employees inside the smoking section. Details are provided in Appendix II.

The motortruck involved was owned and operated by the Oxbow Transport Corporation, Lexington, Massachusetts, which was authorized to operate as an irregular route common carrier within the State of Massachusetts. The motortruck was not subject to the ICC Motor Carrier Safety Regulations. The overall length of the vehicle was 48 feet 3 inches. The tractor, a 1964 Mac, model B61ST, was 9 feet 5 inches long and weighed about 9,000 pounds, according to registration records of the Massachusetts Registry of Motor Vehicles. It was of the cab-behind-engine type and had three axles. The tandem rear axles were equipped with dual wheels. The wheels of all 3 axles were provided with air-mechanical brakes. In addition, the brakes of the rear tandem axle could be applied by springs for use as a parking brake. The semitrailer was of the tank type, and was 38 feet 10 inches long. Its lightweight, according to registration records, was 8,750 pounds. It had tandem axles with dual wheels, and each axle was equipped with air brakes. At the time of the accident, the semitrailer was transporting a cargo of 8,300 gallons of No. 2 fuel oil weighing 58,805 pounds, indicating that the gross weight of the combination vehicle was about 76,555 pounds, or 3,555 pounds in excess of weight limitations prescribed by Massachusetts regulations.

The brake system was equipped with a warning buzzer which sounded in the tractor cab if the air pressure was reduced to below approximately 60 pounds. The brake system was so arranged that if the air pressure was reduced to below approximately 45 pounds, the brakes of the semitrailer would fully apply automatically. The spring-applied parking brakes of the tractor would partially apply automatically when air pressure was reduced to approximately 45 pounds, and this brake application would increase correspondingly with further reductions of air pressure.

In the event of loss of air pressure and the automatic application of the brakes, the driver was unable to release the brakes from within the cab. To release the brakes, it would be necessary to open the drain cock on the trailer air tank to release the air brakes on the trailer. The spring brakes could not be released without air pressure from an outside source, or the use of tools to compress the springs.

No. 563, an eastbound first-class passenger train, left North Station, Boston, at 12:01 a.m. on the day of the accident and proceeded on the outbound track with 28 passengers and a crew comprised of an engineer, conductor, and flagman. At 12:08 a.m., while moving at approximately 20 miles per hour, it proceeded over a drawbridge located 1.6 miles west of the Second Street crossing in Everett, and continued eastward at accelerating speed.

Testimony taken at the hearing indicates the train had attained a speed of 55 to 60 miles per hour when it reached signal P-37, 880 feet west of the Second Street crossing. About this time, the engineer apparently saw that the motortruck involved was stopped across the outbound track at the crossing, or saw warning signals being displayed by the truck driver. He applied the train brakes in emergency, then entered the forward coach section and warned the other crew members and passengers to brace themselves for a collision. A few seconds later, at approximately 12:10 a.m., the train entered the crossing and struck the motortruck on the left side near the front of the tank-type semitrailer.

The leading pair of wheels of the front truck of No. 563 derailed as a result of the collision, and the train stopped with the front end approximately 158 feet east of the collision point. Its speed at the time of the collision could not be definitely determined. However, in view of results of tests made after the accident, it is clear that the emergency brake application initiated by the engineer reduced the train speed somewhat before the collision.

The tank of the semitrailer ruptured on impact and a portion of the oil cargo was thrown into the forward coach section of the train. The tractor was separated from the semitrailer. It stopped, facing westward, on the north side of the train. The semitrailer overturned and stopped upside down against the south side of the forward coach section of the train, breaking side windows of that portion of the train. Its cargo burst into flames on impact, causing the tractor, the semitrailer, and the front portion of the train, to catch on fire. Intense fire and smoke from the overturned semitrailer were directed against the right side of the train, and the interior of the forward coach section caught on fire.

Smoke and heat from the burning interior of the forward coach section and the flaming cargo of the overturned semitrailer began to spread rapidly throughout the interior of both coach sections of the train. The passengers in the forward coach section promptly retreated to the rear coach section, hereinafter referred to as the smoking section, and sought to escape from the train through the doorway and vestibule at the rear end. Meanwhile, most of those in the smoking section also entered the aisle and sought to escape through the rear doorway and vestibule.

One of the first passengers to reach the smoking section door leading to the rear vestibule opened that door, which was hinged to swing inward, and latched it in open position. He or another passenger then opened a side vestibule door and raised the associated trap door, permitting access to the vestibule steps at that location. It appears that another passenger opened the other side vestibule door shortly thereafter, but left the associated trap door in down, or closed position. This prevented immediate access to the vestibule steps at that location and momentarily slowed exit from the train.

After about six passengers and the flagman escaped from the train through the rear vestibule, the smoking section door leading to that vestibule became closed. At approximately the same time, the lights in both sections of the train went out. Testimony taken at the hearing indicates that the smoking section aisle and the narrow passageway immediately inside the closed smoking section inward-opening door were jammed by passengers at this time, preventing the door from being opened inward. Thus the avenue of escape through the rear smoking-section door and vestibule was blocked to those remaining inside the train, trapping them between the closed door and the flames in the forward coach section.

The impact and rupture of the tank resulted in a low-order explosion and a sudden flare-up of flame of such magnitude to attract the attention of two Everett police officers who were nearby, and arrived on the scene within a minute or two after the accident. They immediately proceeded to the vestibule at the rear of the train and saw that the interior of the train was filled with dense smoke. In addition, they saw that the window of the closed door was broken, and that the head and shoulders of a passenger were protruding through the broken window. The police officers attempted to push the door open, but were unable to open it sufficiently for those inside to escape, due to the press of passengers against the inside of the door. Realizing that the people trapped in the train were in dire need of air, the police officers and the driver of the motortruck involved proceeded to one side of the train and attempted to break the sealed, double-pane windows of the smoking section. However, because of the height of the windows above the ground and the lack of proper tools, they were successful in breaking only the outside pane (plate glass) of one window. They were unable to break the thick inside pane (laminated safety glass) of that window. Firemen of the Everett Fire Department arrived at the scene about five minutes after the accident. They also made an unsuccessful effort to open the rear door leading to the smoking section, then started rescue operations by breaking through the side windows of the smoking section with axes and bars. By this time, most of the approximately 24 persons trapped inside the train had been overcome by heat and smoke inhalation.

Twelve of the persons trapped inside the train, including the conductor, were fatally injured as a result of thermal burns and smoke inhalation. Reports of medical examiners indicate that smoke inhalation was the primary cause of death to those persons. One body, which was indentified as the engineer, was found in the aisle of the forward coach section, near the bulkhead separating the forward coach section from the smoking section. The report of the medical examiner indicates the engineer's death was caused by generalized thermal burns. Most of the surviving passengers were injured due to smoke inhalation and/or thermal burns. The flagman was slightly injured.

Nothing was developed at the hearing to indicate that the conductor or any of the passengers trapped inside the smoking section attempted to escape by breaking through side windows. However, it is unlikely that they could have effected an escape by this means without using an axe, bar, hammer, or like object to break through the thick laminated safety-glass panes.

The train was equipped with one emergency tool kit, consisting of a fire extinguisher, an axe, and a crowbar. This kit was recessed behind a sealed glass window in a wall of the narrow passageway at the rear of the smoking section, immediately inside the door leading to the rear vestibule. When the door is latched in open position, access to the tool kit is blocked and its view obscured. Examination after the accident disclosed that the axe and crowbar were still in place and that the window provided for access to those tools was intact. The tool kit, which was in an inconspicuous location, was apparently overlooked by those trapped inside the train.

The engineer of No. 563 had been on duty 39 minutes at the time of the accident, and the conductor and the flagman had been on duty 29 minutes at this time. All 3 of these employees had been off duty at least 14 hours previously.

The driver of the motortruck reported for work at Lexington, Massachusetts, about 6:00 p.m. the evening before the accident, after having been off duty approximately 16 hours. He subsequently made two deliveries of fuel oil for the Northeast Petroleum Corporation plant in Chelsea, Massachusetts. The loading rack at this plant is 2 miles south of the Second Street railroad crossing in Everett.

After completion of the second delivery, the motortruck returned to the Northeast Petroleum Corporation Plant and was loaded with 8,300 gallons of No. 2 fuel oil consigned to a dealer in Lexington. The loading was completed at 11:57 p.m. Immediately thereafter, the motortruck left the loading rack and proceeded en route to Lexington, via the Second Street railroad crossing in Everett. The motortruck made 6 stops at street intersections while en route northward to the railroad crossing and at approximately 12:05 a.m., it stopped on Second Street directly behind another northbound vehicle which had stopped clear of the crossing. When the preceding vehicle started to move over the tracks, the motortruck moved forward about 40 feet and again stopped short of the crossing. A few moments later, when the driver saw his course was clear, he started his vehicle forward in lowest gear and proceeded to move over the crossing at about 3 miles per hour.

The poor condition of the crossing caused the motortruck to bounce severely, and the driver testifies that he may have applied the brakes once or twice after entering the crossing in order to reduce the bouncing action. He did not notice whether the buzzer associated with the brake equipment sounded, but as the motortruck was moving over the crossing, it suddenly stopped across the B&M main tracks without warning. As the driver recalled it, he immediately looked at the air guage in the tractor cab and saw that the air pressure in the brake system had dropped to 30 pounds, indicating that the tractor parking brake was partially applied and that the semitrailer brakes were fully applied, causing the motortruck to stop. He further testified that the air pressure then dropped to zero, as indicated by the air guage. At that time the driver applied power with the transmission in neutral gear, in order to accelerate the tractor air compressor and restore air pressure in the brake system. This action, however, was unsuccessful in restoring any air pressure. Shortly thereafter he attempted to restart his vehicle forward in low gear, but this only caused the vehicle to lurch and the clutch to overheat.

Realizing that the motortruck was stalled in a precarious position, the driver stopped a passing motorist and informed him of the situation. He also requested the motorist to contact the Everett police station and ask a police official to warn the proper B&M authority that the motortruck was stalled on the crossing. It is the motorist's testimony that the truck driver also asked him if he had any flares, indicating that the truck had no signal device, such as fusee, flashlight, lantern, or similar device for displaying warning signals by hand. The motorist, who regularly drove over the Second Street crossing between approximately 12:08 and 12:10 a.m., replied that he had no flares and warned the truck driver that an eastbound B&M passenger train was soon due at the crossing. A few moments later, evidently when No. 563 reached a point 3,091 feet west of the crossing, the motorist and truck driver heard the bells of the automatic crossing-warning signals start to sound and saw the red lights of those signals start to flash, and they immediately realized that a train was then approaching the crossing.

According to the truck driver's testimony, neither he nor the motorist could see the approaching train when the crossing-warning signals started to function, evidently due to their view being blocked by the buildings in the northwest angle of the crossing, the pole line along the north side of the track structure, and curvature of the track west of the crossing. The truck driver testified that he immediately started to run westward between the B&M main tracks, followed by the motorist. He testified the train came into view after it had entered the 2-degree curve located west of the crossing, indicating that No. 563 was within 950 feet of the crossing at this time. The truck driver further testified that shortly thereafter, when he had reached a point about 225 feet west of the crossing, the train passed him, then struck the motortruck stalled on the crossing. The motorist, who was displaying warning signals with a white coat while running westward, estimated that he and the truck driver had proceeded between 600 and 750 feet from the crossing when the train passed. Under the circumstances, however, it appears that the truck driver's estimate as to this distance is more accurate. Testimony of the truck driver and motorist indicates that neither noticed whether the engineer acknowledged their warning signals, and that neither noticed whether the train brakes had been applied before the collision. Both the truck driver and motorist ran to the train immediately after the collision, and helped passengers to alight from the rear vestibule. About the time they reached that vestibule, the 2 Everett police officers arrived on the scene.

The truck driver was Raymond F. Bouley, age 29, of Billerica, Massachusetts, who is an experienced driver of equipment of the type involved and holds an unexpired Massachusetts motor vehicle operator's license. The tractor and trailer were registered in the Commonwealth of Massachusetts and bore 1966 Massachusetts registry of motor vehicles registration numbers. Both the tractor and the trailer were equipped with all required lights and reflectors. The motortruck had reflector-type "flares" which are designed for roadside breakdown protection. The tractor-trailer was not equipped with any device with which to give an effective warning of its precarious position on the crossing, nor was it required to have any such device by law. The crossing itself was not equipped with any method of warning an oncoming train of the presence of a disabled motor vehicle in its path.

There was no violation of any Federal law in the described operation or equipping of this motor-vehicle unit. There was a violation of Massachusetts weight-limit regulations in that the gross weight of the combination vehicle was approximately 3,555 pounds in excess of the prescribed limitation.

Examination of train No. 563 after the accident disclosed that the vestibule at the front end was virtually destroyed (see Appendix II). However, examination of the controls in this vestibule disclosed that the automatic brake valve was in emergency position, and that the cutout cock of the safety control feature was sealed in open position. After blocking off damaged lines at the front end, the air brake system was tested from the control compartment at the rear end and was found to be functioning properly. One of the collision posts at the front of this vestibule was sheared off as a result of the impact. The other collision post withstood the impact, but was askew. The interior of the forward nonsmoking coach section was destroyed by fire. The smoking-section interior was heavily damaged as a result of heat and smoke from the fire. Except for some damage at the front end, appurtenances underneath the body of the unit sustained little or no damage.

Tests were conducted after the accident with a B&M diesel-powered passenger unit similar to that involved in the accident to determine sighting and braking distances. The tests were made at night under conditions similar to that prevailing at the time of the accident. The first test revealed that a person standing with a lighted lantern on the south rail of the outbound track at the crossing could first be seen by the engineer of an approaching eastbound train at 1,208 feet, indicating that the amber running lights mounted on the left side of the motortruck semitrailer were probably first visible to the engineer of No. 563 at approximately the same distance. For the second test, the diesel-powered passenger unit backed up on the outbound track to the drawbridge located 1.6 miles west of the crossing. The engineer was then instructed to have the unit approach the crossing as rapidly as possible, and to apply the brakes in emergency when he first saw the person with the lighted lantern on the outbound track at the crossing. In this test the train was moving at 58 miles per hour when the engineer saw the lighted lantern at a distance of about 1,200 feet. By the time he reacted to this and initiated the emergency brake application, the unit was 845 feet from the crossing. A few seconds later, it moved over the crossing at 28 miles per hour, and stopped 417 feet beyond. For the third and final test, arrangements were made with a railroad signal supervisor to have him run westward from the crossing waving his jacket as a warning signal when the crossing-warning signal started to function. The diesel-powered passenger unit was again backed up to the drawbridge, and the engineer was instructed to have the unit move over the crossing at 60 miles per hour. He was not informed of the arrangement with the signal supervisor. In this test the signal supervisor reached a point 427 feet west of the crossing when the passenger unit passed him. The unit had attained a speed of 56 miles per hour when the engineer saw the warning signal displayed by the signal supervisor at a distance of about 90 feet. By the time the engineer reacted to this and initiated the emergency brake application, the unit had passed the signal supervisor and was approximately 300 feet from the crossing. A few moments later, it moved over the crossing at 53 miles per hour and stopped 723 feet beyond.

Since first reports of the accident strongly indicated that the motortruck stalled on the crossing due to a failure in its brake system, expert representatives of the Massachusetts Department of Public Utilities, the Massachusetts Registry of Motor Vehicles and the Interstate Commerce Commission made examinations of the damaged motortruck prior to the hearing in order to determine, if possible, the cause of the brake failure.

Because of extensive damage to the tractor, the examinations could produce no conclusive findings as to whether a defective condition of the tractor brake system caused the motortruck to stop on the crossing. The interior of the cab of the tractor was destroyed by fire, including control valves in the cab for the brake system. The jumper air hoses between the cab and the semitrailer were burned off.

The front end of the semitrailer was considerably damaged in the accident, and the supply and application lines at the front end were so badly damaged that an inspection could not be made of those lines in the brake system. A test was made with the damaged lines being cut about midway back on the semitrailer, and air pressure was applied with the result that the air brakes of the semitrailer functioned properly. During examination of the relatively undamaged portion of the system that remained, it was disclosed that the connection at the limiting valve to the tractor front wheels showed evidence of slight air leakage which would occur whenever the foot brake was applied. In addition, there was evidence of an existing small crack in the hose to the left front wheel brake chamber, which could have leaked when the foot brakes were used. A 90° elbow fitting in the air line to the left brake chamber on number three axle of the tractor was found to be broken after the accident. It could not be determined whether this was a result of the accident.

Although the tractor and trailer involved in this accident were not then engaged in interstate commerce, the combination vehicle was equipped with braking systems in accordance with the regulations of the Interstate Commerce Commission contained in Title 49 Code of Federal Regulations, Part 193 because Oxbow Transport Corporation vehicles do operate as transient carriers on occasion in interstate commerce. The regulations which were promulgated by and administered by the Interstate Commerce Commission on the date of this accident, and which are now administered by the Federal Highway Administration of the Department of Transportation specify for this type of vehicle when equipped with air brakes and used for towing other vehicles equipped with air brakes, that there be two means of activating the emergency features of the trailer brakes. One of these means shall operate automatically in the event of reduction of the towing vehicle air supply to a fixed pressure, which shall not be lower than 20 pounds per square inch, nor higher than 45 pounds per square inch. The other means shall be a manually controlled device readily operable by a person seated in the driving seat. Its emergency position or method of operation shall be clearly indicated. In no instance may the manual means be so arranged to prevent operation of the automatic means. The automatic and manual means required by these regulations may be, but are not required to be, separate. In addition, every singly driven motor vehicle and every combination motor vehicle shall at all times be equipped with a parking brake or brakes adequate to hold the vehicle or combination on any grade on which it is operated under any condition of loading on a surface free from ice or snow. The parking brake or brakes shall at all times be capable of being applied in conformance with the requirements by either the driver's muscular effort or by spring action or by other energy. If such other energy is depended on for application of the parking brake, then that energy shall be isolated from any common source and used exclusively for the operation of the parking brake. The parking brake shall be so designed, constructed and maintained that when once applied, it shall remain in the applied condition with the required effectiveness despite exhaustion of any source of energy or leakage of any kind, and so that it cannot be released unless adequate energy is available upon release of such brakes to make immediate further application with the required effectiveness.

Chapter 90, Section 7 of the Massachusetts Motor Vehicle Law required the tractor and semitrailer in this case to be provided with full air brakes or hydraulic brakes with vacuum power assist or air power assist for the tractor, and air or electrical brakes for the semitrailer with a further proviso that one braking system shall be so constructed that it can be set to hold the vehicle stationary. Although the Massachusetts Motor Vehicle law provides "all braking systems shall be constructed and designed so as to permit modulated control of brake application and release by the operator from the normal operating position", there is a proviso that any commercial motor vehicle, semitrailer or trailer used in interstate commerce which shall conform as to its equipment with the regulations established from time to time by the Interstate Commerce Commission, shall be deemed to conform to the requirements of Massachusetts Law.

The Oxbow Transport Corporation tractor semitrailer involved in this accident did not have any means for releasing the brakes once they were applied automatically, due to loss of air pressure, and there was no provision for such means in Part 193 of Title 49, Code of Federal Regulations.

At the close of the hearings, interested parties were invited to make their recommendations. Briefs were filed separately by the Bureau of Enforcement, Interstate Commerce Commission, and by the National Tank Truck Carriers, Inc. Both the Bureau and the National Tank Truck Carriers recommended in their briefs that the findings of the Interstate Commerce Commission in Prevention of Rail-Highway Grade Crossing Accidents, 322ICC1, decided January 22, 1964, be reviewed, updated and renewed to the extent found warranted under current conditions. A hard look at the emergency escape provisions in rail-passenger cars, including both emergency exits and emergency escape equipment, is also stressed by both of these parties. The design of the upcoming cars for the high-speed rail corridor in the northeast is cited as a special reason for a review of these factors at this time.

## CONCLUSIONS

The Board concludes that:

(1) The collision at 12:10 a.m. on December 28, 1966, at the Second Street railroad-highway crossing in Everett, Massachusetts, between the single-car passenger train 563 operated by the Boston and Maine Corporation and the motor tank truck operated by the Oxbow Transport Corporation, resulted in the death of 11 of a total of 28 passengers and two of the three train crew members, and other injuries and extensive damage to both the train car and the motortruck.

(2) The collision ruptured the 8,500-gallon tank of the truck resulting in a portion of the oil cargo being thrown against and into the forward section of the train. Low-order explosions and the rapid spread of fire from the flammable fuel oil contributed to the fatalities which followed the collision.

(3) The train was being operated in conformity with all applicable rules and regulations as it approached the crossing.

(4) The driver of the motortruck exercised all due caution in stopping before entering the crossing; and at the time he commenced the crossing of the railroad tracks, the warning signals were not indicating the approach of a train.

(5) There was a loss of air pressure in the brake system of the motortruck from an undetermined cause, and this loss led to an automatic application of the brakes on the tractor and semi-trailer which stopped the motortruck directly across the Boston and Maine tracks at the Second Street crossing.

(6) The brake system on the motortruck was installed in compliance with Massachusetts State law and the regulations of the Interstate Commerce Commission.

(7) The arrangement of the brake system on the motortruck was such that with loss of air pressure, the driver in the cab of the tractor was unable to release the brakes and move the vehicle from its precarious position before the collision.

(8) It could not be determined at which point the train's brakes were applied in emergency before the collision, but based upon tests made after the collision, it is reasonable to presume that the application of brakes was made at some point between 1,200 feet and 800 feet from the collision location. From tests made after the collision, it is evident that, at the maximum sighting distance of 1,200 feet from the crossing, the train traveling at a speed of approximately 60 miles per hour could not stop before reaching the crossing location even with emergency application of brakes.

(9) There was no system in existence at the crossing by which either the driver could warn the engineer on the train, or the engineer could be advised of the presence of the truck stalled across the tracks at the crossing.

(10) The automatic railroad crossing-warning signals were functioning properly, but were not pertinent in this case since the truck had stalled on the tracks before the signals were actuated by the presence of the approaching train.

(11) There were no emergency exits in the railway car. The emergency equipment that was in the car that could have been used to break windows was located so that when the only door available for escape was opened to lead to the rear vestibule, the emergency equipment was hidden behind the door. There was no emergency lighting system on the train car. When the lights of the train went out, confusion and panic were increased during the attempt of the passengers to escape from the burning and smoke-filled car. The normal passenger-exit doors proved inadequate as a means of escape under conditions of darkness and panic.

## PROBABLE CAUSE

The Board determines that the probable cause of this accident was the loss of air pressure in the brake systems for the tractor and trailer, which resulted in an automatic application of the brakes that could not be released from the cab of the tractor, and therefore held the tractor-trailer directly across the Boston and Maine tracks at the collision point.

The Board further determines that the cause of most of the deaths and injuries was not the impact of the collision, but the lack of emergency exits in the car, in addition to the inward-opening center rear door that became jammed in a closed position by persons attempting to escape.

## RECOMMENDATIONS

The Board recommends that:

(1) The Secretary of Transportation, with representation from the National Transportation Safety Board, continue to study and review the railroad-highway grade crossing problem in all of its aspects. Reference is made to the short range and long range programs announced by the Secretary of Transportation in his news release of August 8, 1967 (copy in Appendix V).

(2) The Secretary of Transportation seek legislation to authorize the Federal Railroad Administrator to prescribe regulations requiring:

(a) Emergency means of escape from railroad passenger cars.

(b) Emergency lighting for railroad passenger cars.

(3) The Board notes that on passenger-carrying railroad cars, the exit doors normally open inward. The Board recommends that the Federal Railroad Administrator initiate studies and action that will insure that, in emergency, passengers can reliably escape from regular exits of passenger-carrying railroad cars.

(4) The Department of Transportation include in its grade-crossing protection study and action program the problem of motor vehicles stalling on railroad tracks and methods of warning

approaching trains to prevent a collision. The study should include all technical methods which could have a bearing on the problem such as means of warning the crew of the oncoming train, special means to be carried by vehicles loaded with hazardous cargo for activating the railroad signal system, and methods of reducing the emergency stopping distance of existing and future rail equipment.

(5) The Federal Highway Administrator take under immediate consideration the revision of existing regulations under his jurisdiction in order to:

(a) Require an emergency means within the cab of a motortruck by which brakes, which have been applied automatically to the tractor and/or trailer because of the loss of air pressure in the braking systems can again be released.

(b) Require motor vehicles of unusual size and those carrying flammable, toxic or other hazardous cargo to use grade crossings offering minimum risk of vehicle stalling or stopping on the crossing. Criteria for designation of such crossings might include approaches free from steep grades and curves, freedom from nearby traffic lights on highway and other sources of traffic congestion, smoothness of crossing pavement, sight distance along the railroad track, and positive grade separations such as overpasses.

Where grade crossings are designated, consideration should be given to developing means of displaying a stop signal to rail traffic during the time truck is actually crossing the tracks.

(c) Require emergency flares of high brilliance from a self-contained power source to be carried on all motortrucks subject to Bureau of Motor Carrier Safety regulations, in order to provide visual warning in an emergency. Emergency flares should not be of a type that might represent a fire hazard.

(d) Require all drivers of motor vehicles subject to Bureau of Motor Carrier Safety regulations to demonstrate knowledge of and use of emergency signals and emergency procedures.

(6) The Federal Highway Administrator study the feasibility of fire resistance regulations for tank trucks carrying flammable fluids to prevent low-order explosions and rapid propagation of flame from such tanks when they are ruptured. Such techniques as lining tanks with soft material or filling tanks with special reticulated foam are known to be technically effective in preventing such rapid flame spread. These methods would also be important in preventing fires following highway accidents and their feasibility as to future cost and weight should be evaluated.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

12/28/67 3:57

Joseph J. O'Connell, Jr. Date Time
Chairman

12/28/67 4:50 P.M.

Oscar M. Laurel Date Time
Member

12/28/67 3:00 P.M.

John H. Reed Date Time
Member

12/28/67 3:30 P.M.

Louis M. Thayer Date Time
Member

12/27/67 5 p.m.

Francis H McAdams Date Time
Member

Notation 52, December 27, 1967
Boston and Maine Corporation
Single diesel-powered passenger car 563
collision with Oxbow Transport Company tank truck
at Second Street railroad-highway grade crossing
Everett, Massachusetts
December 28, 1966

# APPENDIX I

## PARTIES IN INTEREST

1. Interstate Commerce Commission - John H. O'Brien and Robert George Parks

2. Massachusetts Department of Public Utilities - Edward G. Seferian and Herbert Baer

3. Oxbow Transport - Julian Soshnick

4. Boston and Maine Corporation - John J. Nee and Chester A. Prior

5. Budd Company - Neal Holland and John T. Collins

6. National Tank Truck Carriers, Inc. - C. Austin Sutherland

7. Brotherhood of Locomotive Engineers - Ernest C. Hopkins

8. Brotherhood of Railroad Trainmen and for John McKeon and Mrs. Thomas Bagley - Joseph F. Feeney

9. Brotherhood of Railroad Trainmen - Daniel J. Mahoney and John L. Scanlan

10. Brotherhood of Maintenance of Way Employees - Charles E. Brode

11. Brotherhood of Locomotive Firemen and Enginemen - H. G. Spencer

## APPENDIX II

Photo No. 1 - View of crossing from a point 840 feet westward on the outbound track.

Photo No. 2 - View of crossing showing curvature of track and signal P-37.

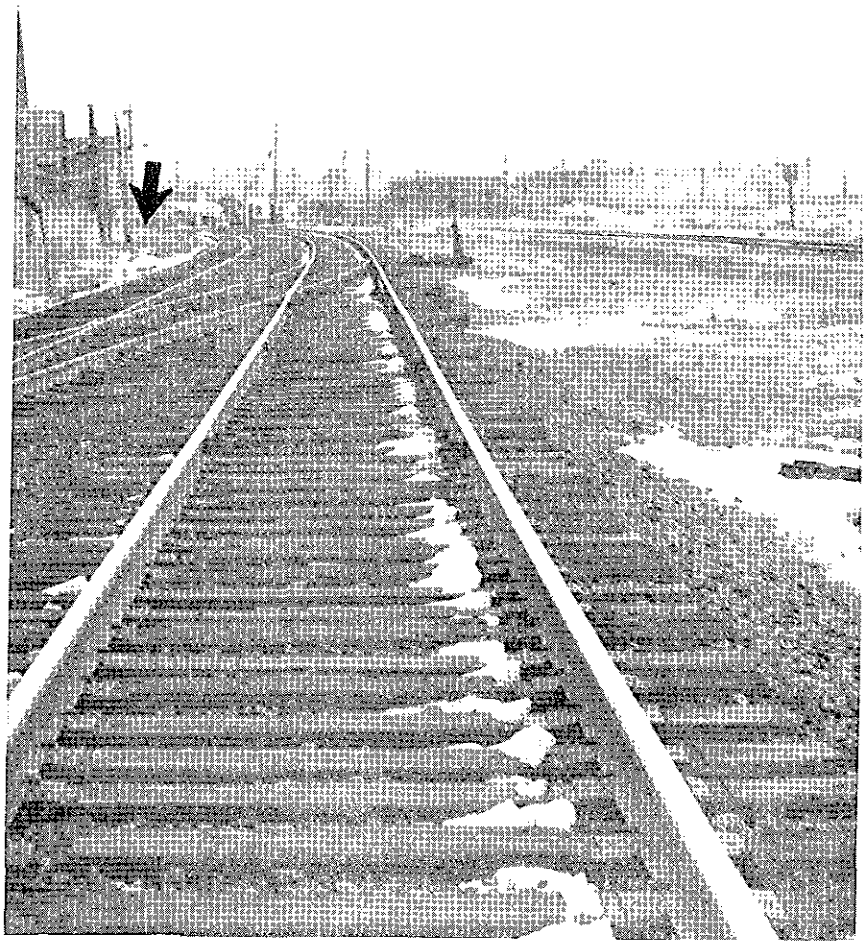
Photo No. 3 - Train No. 563, side-view after accident

Photo No. 4 - Train No. 563 - front end after accident

Item No. 1 - Sketch of inside of rear portion of train No. 563

Item No. 2 - Sketch of track, crossing and accident area in general

Photo No. 1



View of crossing from a point 840 feet westward on the outbound track. Arrow points to collision point.

Photo No. 2

View westward from Second St. Crossing. B&A tracks in foreground, and crossing-watchman's shanty at left. Rear end of vehicle at right is on the B&M outbound track at point of collision. Arrow points to signal P-37.

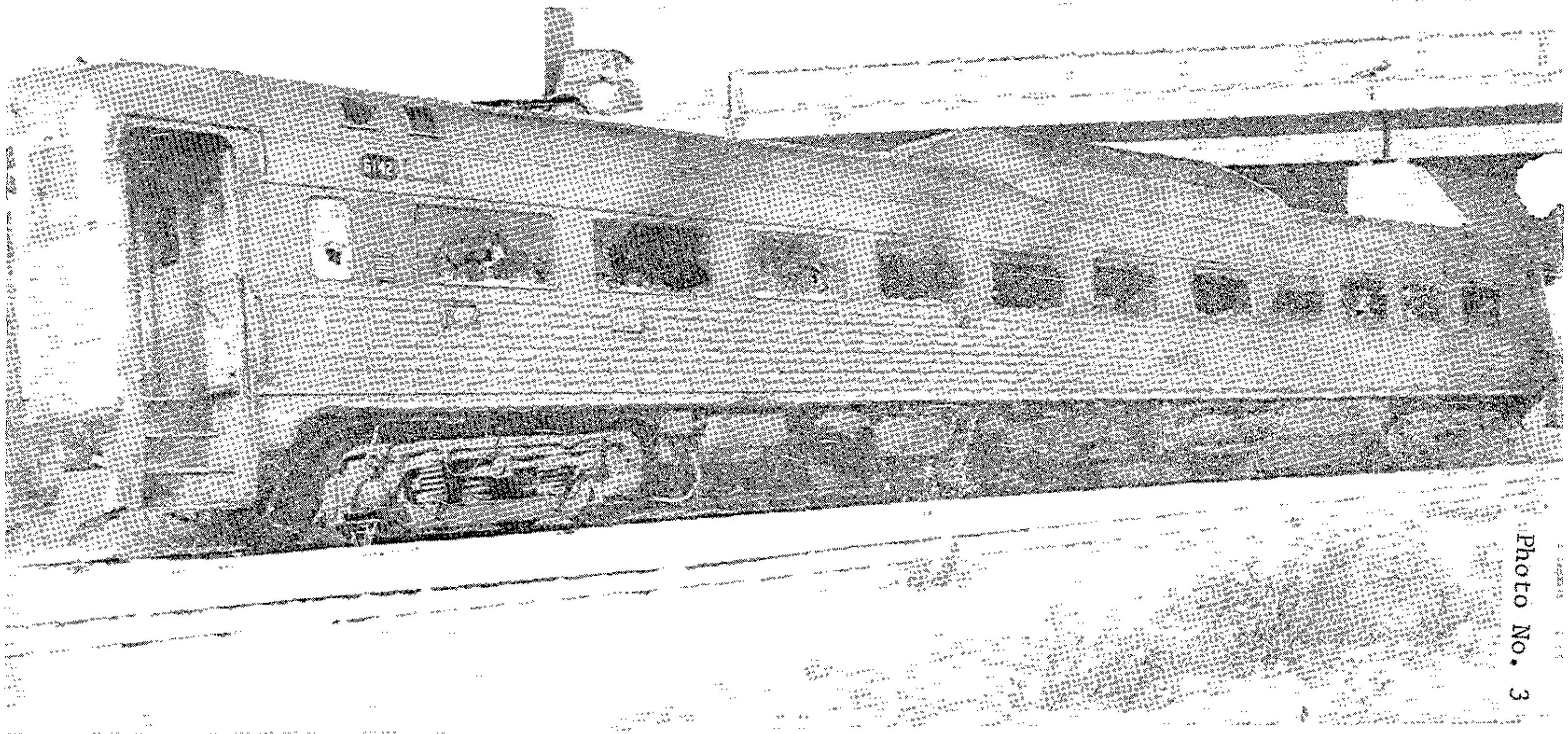


Photo No. 3

Train No. 563. Rear of train at left.

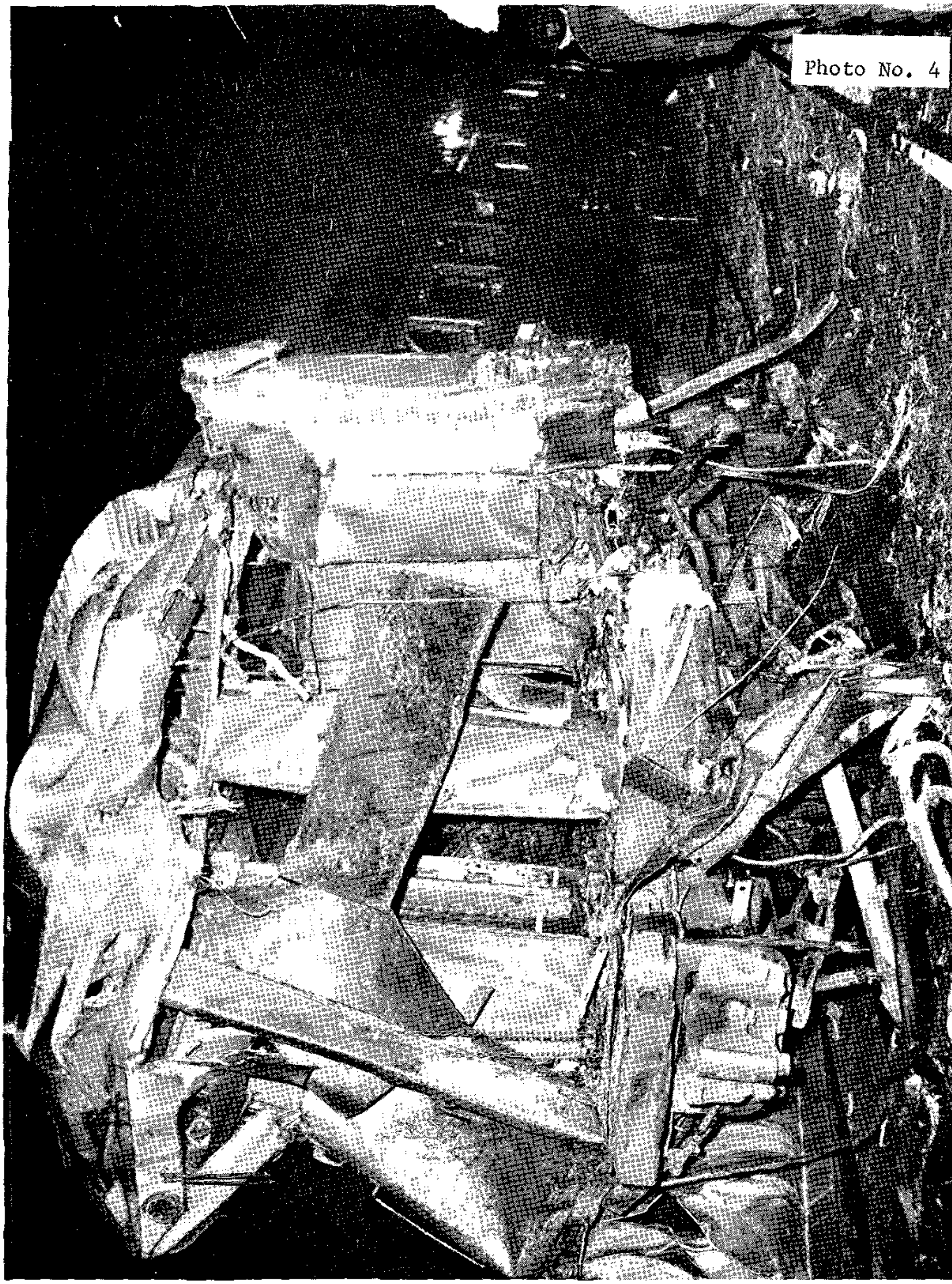
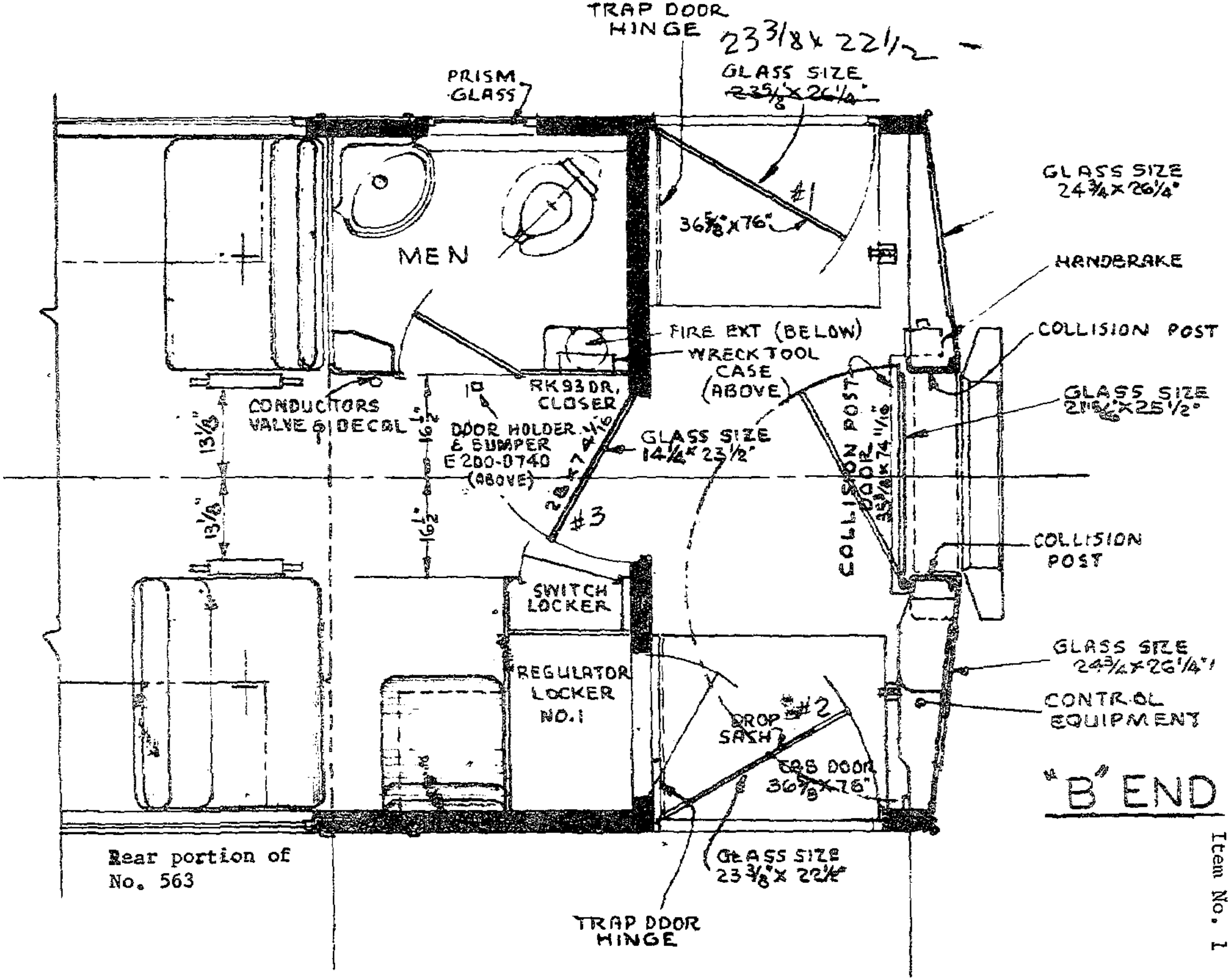


Photo No. 4

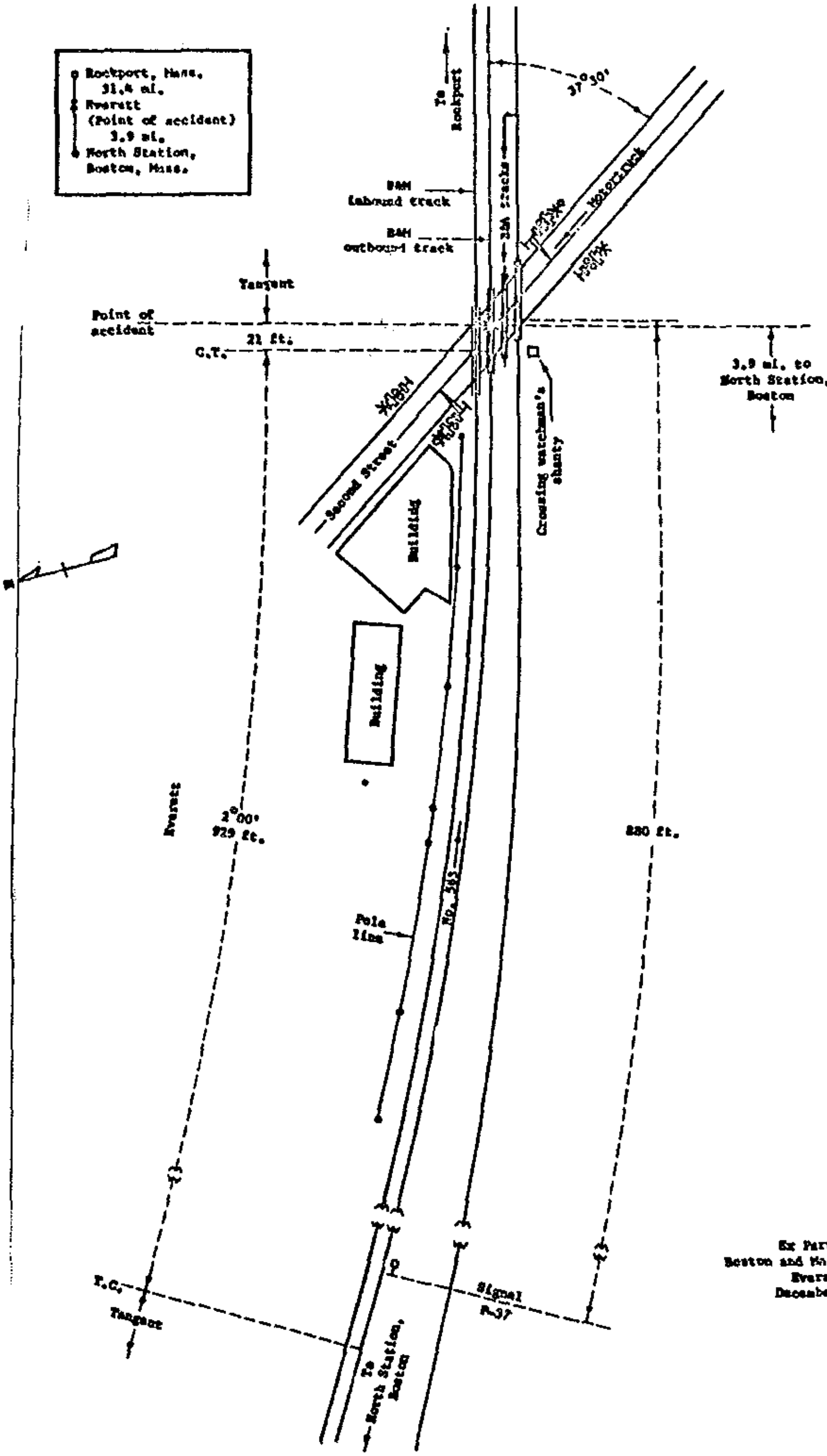
Front end of No. 563.




Rear portion of
No. 563

- 45 -

Item No. 1




Ex Parte No. 254
Boston and Maine Corporation
Everett, Mass.
December 23, 1966

# APPENDIX III

## CROSSING AND CROSSING WARNING SIGNALS

An automatic crossing-warning signal of the flashing red-light type with bell and crossbuck is located adjacent to the east side of Second Street, 13 feet south of the southernmost rail of the crossing. An automatic crossing gate about 23 feet in length is attached to the mast of the crossing-warning signal. A similar crossing-warning signal and crossing gate is adjacent to the west side of Second Street, 17 feet north of the northernmost rail. An automatic crossing gate, for pedestrians, is also on the north side of the crossing.

The circuits of the crossing-warning signals and gates are so arranged that when an eastbound train on the outbound track reaches a point 3,091 feet west of the crossing, the bells and red lights of the crossing-warning signals start to function. Four seconds later, the automatic gates start to lower. Eleven seconds later, the gates are fully lowered in horizontal position over the surface of Second Street.

A whistle, or ring, post for eastbound movements on the outbound track is located 1,319 feet west of the crossing.

## RAILROAD CARRIER'S OPERATING RULES AND TIMETABLE SPECIAL INSTRUCTIONS APPLICABLE TO THIS TERRITORY

"14. Engine Whistle Signals

Note. - The signals prescribed are illustrated by "o" for short sounds; "__" for longer sounds. ***

| SOUND | INDICATION |
| --- | --- |
| *** | |
| (1) __ __ o o | In the State of Massachusetts: Enginemen will cause the engine bell to be rung from the whistle post to the crossing, and in addition whistle signal sounded just before reaching crossing, *** |

***

Operating Rules

17. The headlight, lighted, will be displayed to the front of every train by day and by night. ***

Timetable Special Instructions

14. Engine Whistle Signals

Public crossing signal 14 (1) is not to be sounded for the crossings or in the territory as listed below except in cases of emergency:

***

Between Boston and Salem

***"

According to timetable special instructions, the maximum authorized speed for passenger trains in the accident area is 60 miles per hour.

## MASSACHUSETTS MOTOR VEHICLE LAW

GENERAL LAW, CHAPTER 90 SECTION 7 RELATING TO BRAKES

Every motor vehicle operated in or upon any way shall be provided with brakes adequate to control the movement of such vehicle and conforming to rules and regulations made by the registrar. ***
Except in the case of a school bus or fire apparatus, every motor vehicle and every tractor which is designed and used for drawing another vehicle, having an unladen weight of more than ten thousand pounds, shall be equipped with full air brakes or hydraulic brakes with vacuum power assist or air power assist. All braking systems shall be constructed and designed so as to permit modulated control of brake application and release by the operator from the normal operating position. Every trailer or semi-trailer having an unladen weight of more than ten thousand pounds shall be equipped with air or electrical brakes. One braking system shall be so constructed that it can be set to hold the automobile stationary.

Notwithstanding the preceding provision of this section, any commercial motor vehicle, semi-trailer or trailer, used in interstate commerce, which shall conform as to its equipment with the regulations established from time to time by the Interstate Commerce Commission shall be deemed to conform to the requirements of this section.

# APPENDIX IV

## LIST OF PERSONS KILLED

Passengers

1. Bruce Amaral; 11 Riverdale Park, Gloucester, Mass.
2. Paul Amero; 13 Riverdale Park, Gloucester, Mass.
3. Graham Arthur Atkinson; 611 Kent Street, Rome, N. Y.
4. Joseph P. Campbell; 13 Ash Street, Danvers, Mass.
5. Donna DesRoche, 18 Russel Avenue, Gloucester, Mass.
6. Louis Arthur Houle; Woodward Avenue, West Gloucester, Mass.
7. Patricia Hubbard; Hale Street, Beverly, Mass.
8. John Joseph Mahan; 69 Atlantic Avenue, Swampscott, Mass.
9. John Robert Malcolm; 1 Hilltop Avenue, Lexington, Mass.
10. Joseph R. Mondello; 41 Sabieski Street, Buffalo, N.Y.
11. John Moore; 34 Magnolia Avenue, Magnolia, Mass.

Crew Members

12. Thomas Bagley; 189 Montvale Avenue, Woburn, Mass.
13. Edwin P. Hunt; 8 Hurlburt Road, Billerica, Mass.

APPENDIX V

NEWS RELEASE

U. S. DEPARTMENT OF TRANSPORTATION
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20590

FOR IMMEDIATE RELEASE
August 8, 1967

DOT -- 6267
962-5157

Secretary of Transportation Alan S. Boyd today ordered an immediate program to reduce rail-highway grade crossing accidents.

Pointing out that an estimated 1,800 persons will be killed this year in grade crossing accidents, Boyd ordered the Federal Highway Administration and the Federal Railroad Administration to begin an "immediate action program."

The Secretary directed that special consideration be given to grade crossings in the heavily traveled Northeast Corridor where the new high-speed trains are scheduled for operation beginning this fall.

The Secretary directed Federal Highway Administrator Lowell K. Bridwell, and Railroad Administrator A. Scheffer Lang, to ask each state highway department to select one grade crossing for each 4,000 miles of Federal-aid highway system for testing of the "most suitable known or proposed system of protection." This would involve about 200 crossings in the nation. The knowledge gained through this special effort, he said, would help improve design and development of protective devices for general use.

Boyd said it is estimated that in 1967 there will be more than 14,000 accidents at rail-highway grade crossings. More than 15,000 persons will be injured and the total property losses will be about $100 million.

While only a quarter of the total number of accidents involve vehicles and trains, most of the fatalities result from these accidents.

"The railway-highway grade crossing problem is a railroad, highway, and public problem which requires an intensive attack on all factors which contribute to such accidents," Boyd said. In urging his "action program," the Secretary pointed out that up to 10 percent of funds available to the states under the Federal-aid highway program may be used for improvement or elimination of grade crossings in the Federal-aid highway system. Funds available to the states for safety programs under the Highway Safety Act of 1966 also may be used for inventorying or appraising grade crossing problems on roads and streets which are not part of the Federal-aid highway system.

Boyd also directed Administrators Bridwell and Lang to:

* Make available immediately to all states guidelines for diagnosing hazards, based on information which currently is available in the Federal Highway and Railroad Administrations.

"Through use of these guidelines and a diagnostic team, cooperating with both railway and highway representatives, literally hundreds of grade crossings may be upgraded by on-the-spot improvements," Boyd said. This could include such things as advanced warning signs, vegetation control, correcting light alignment and crossing illumination.

* Encourage the railroads to "rehabilitate existing protective devices and grade crossing sites under their jurisdiction."

* Launch a research and development program for more effective measures and devices to reduce occurrence of grade crossing accidents.

* Develop better methods, in cooperation with rail, state and local officials, for providing suitable investigation data.

* Intensify grade crossing accident investigation by the Bureaus of Motor Carrier Safety and Railroad Safety.

* Intensify the efforts of the Bureaus of Motor Carrier Safety and Railroad Safety in investigating grade crossing accidents involving Federally-regulated carriers.

* Work with state and local school officials to identify possible rerouting of school buses.

Boyd also ordered a review of present Federal and state regulations and laws for mandatory stopping of certain vehicles and asked for identification of crossings used by vehicles carrying hazardous materials.

# # #