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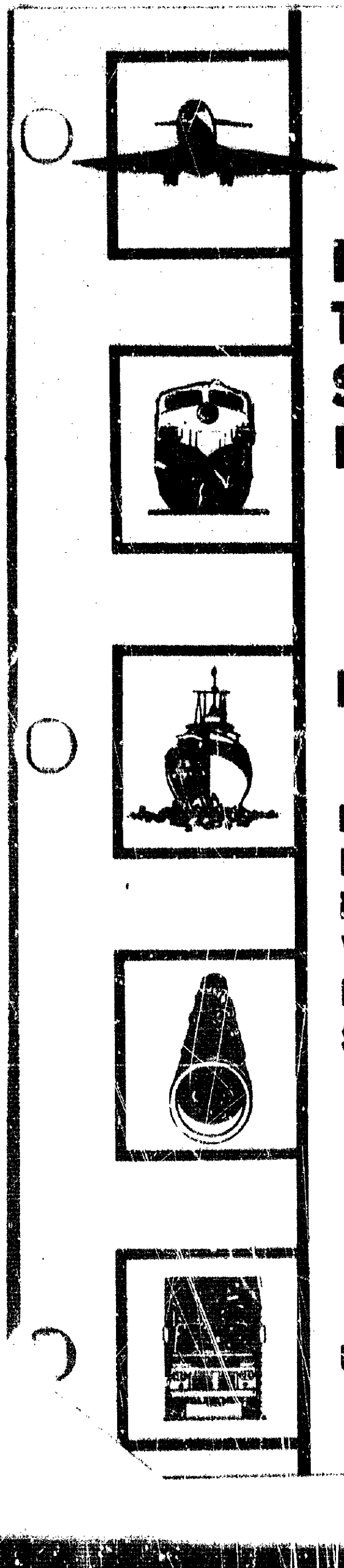

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

HEAD-END COLLISION OF LOUISVILLE AND NASHVILLE RAILROAD LOCAL FREIGHT TRAIN AND YARD TRAIN AT FLORENCE, ALABAMA SEPTEMBER 18, 1978

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

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16. Abstract

About 10:31 a.m., c.d.t., on September 18, 1978, Louisville and Nashville Railroad local freight train Extra 542 South collided head-on with L&N yard train No. 101 on the single main track within yard limits at Florence, Alabama. Both locomotive units and one car of each train were derailed. Three train crewmembers were killed. Since an LPG tank car was derailed and oil was spilled from ruptured locomotive fuel tanks, local officials evacuated about 1,000 persons from nearby residences. Total damage was estimated to be $462,500.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer of Extra 542 South to operate his train at a speed that would have permitted stopping the train within one-half the available sight distance as required by L&N operating rules. Contributing to the severity of the accident was the failure of the engineer of Extra 542 South to apply his train's brakes after he was in a position to see the opposing train. Contributing to the collision was the failure of the L&N management to insure that all operating rules were being complied with, particularly those involving the operation of two trains in opposite directions on the same track.

17. Key Words Head-end collision; local freight train; yard train; single-main operation; yard operation; sight distance; judgment; car spacing; hazardous materials rules; rules compliance; crew training; supervision; vehicle crashworthiness; hazardous materials regulations (Part 174); railroad operating rules (Parts 217, 218); railroad power brakes (Part 232).		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22151	
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RAILROAD ACCIDENT REPORT

Adopted: February 22, 1979

HEAD-END COLLISION OF LOUISVILLE AND NASHVILLE RAILROAD LOCAL FREIGHT TRAIN AND YARD TRAIN FLORENCE, ALABAMA SEPTEMBER 18, 1978

SYNOPSIS

About 10:31 a.m., c.d.t., on September 18, 1978, Louisville and Nashville Railroad local freight train Extra 542 South collided head-on with L&N yard train 101 on the single main track within yard limits at Florence, Alabama. Both locomotive units and one car of each train were derailed. Three train crewmembers were killed. Since a placarded LPG tank car was derailed and oil was spilled from ruptured locomotive fuel tanks, local officials evacuated about 1,000 persons from nearby residences. Total damage was estimated to be $462,500.

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INVESTIGATION

The Accident

On September 18, 1978, southbound Louisville and Nashville (L&N) local freight train Extra 542 South, consisting of 3 diesel-electric locomotive units, 36 cars, and 1 caboose, departed Mt. Pleasant, Tennessee, at about 6:45 a.m. for Florence, Alabama. En route the train stopped five times to set off or pick up cars; the last stop was made at the Cities Service siding 4.9 miles north of Florence. Extra 542 South left the siding about 10:25 a.m. with the engineer and head brakeman on the lead locomotive unit, which the engineer operated from the right side and the conductor and flagman in the caboose at the rear of the train.

The conductor and flagman of Extra 542 South estimated their train's speed was 25 mph as it approached the Florence yard limit board. They also stated the engineer subsequently made a 15-pound service application of the brakes which reduced the speed to about 15 mph as the train reached a 1.5-percent descending southbound grade and entered a 1,500-foot compound curve north of Florence Yard. From the time his train entered the 5° portion of the curve, the engineer's range of vision was restricted to about 375 feet by foliage along the inside of the curve. About 10:31 a.m. Extra 542 South collided head-on with L&N yard train No. 101 on the 5° portion of the curve. (See figures 1 and 2.) There was no evidence that the engineer of Extra 542 South made an emergency brake application, although he was observed seated in the lead unit just before the collision.

The crew of train No. 101 had reported for duty at Florence at 8:00 a.m. Their locomotive consisted of two diesel units operated in multiple-unit control but separated by a 50-foot flat car used as an idler. 1/ After performing switching in and around Florence, they departed for an industrial plant, 1.7 miles to the north, shortly before 10:30 a.m. with the locomotive and six loaded cars. The conductor and head brakeman were in the cab of the lead unit, the engineer was operating the locomotive from the trailing unit, and the rear brakeman was riding the rear car of the train.

After traveling about 1 mile from Florence Yard, train No. 101 entered the 4° portion of a 1,500-foot compound curve to the right where the engineer said he reduced throttle and decelerated the train from 15 to about 10 mph. At a point about 900 feet into the curve, the engineer said he saw the approaching head end of Extra 542 South about 275 feet north of the leading end of his train. The engineer said he immediately applied his train's brakes in emergency and braced himself for a collision. The first men to see the approaching train was apparently the head brakeman in the lead yard unit. In his haste to escape from the unit, he failed to open the emergency brake valve, but he said he shouted a warning over his portable radio. No one on either unit of the yard train sounded the whistle.

Injuries to Persons

	Extra 542 South Traincrew	Yard Job 101 Traincrew	Bystanders
Fatal	2	1	0
Nonfatal	0	0	0
None	2	3	2

1/ An arrangement designed to distribute the weight of the diesel units sufficiently to comply with weight limitations of a bridge near Florence.

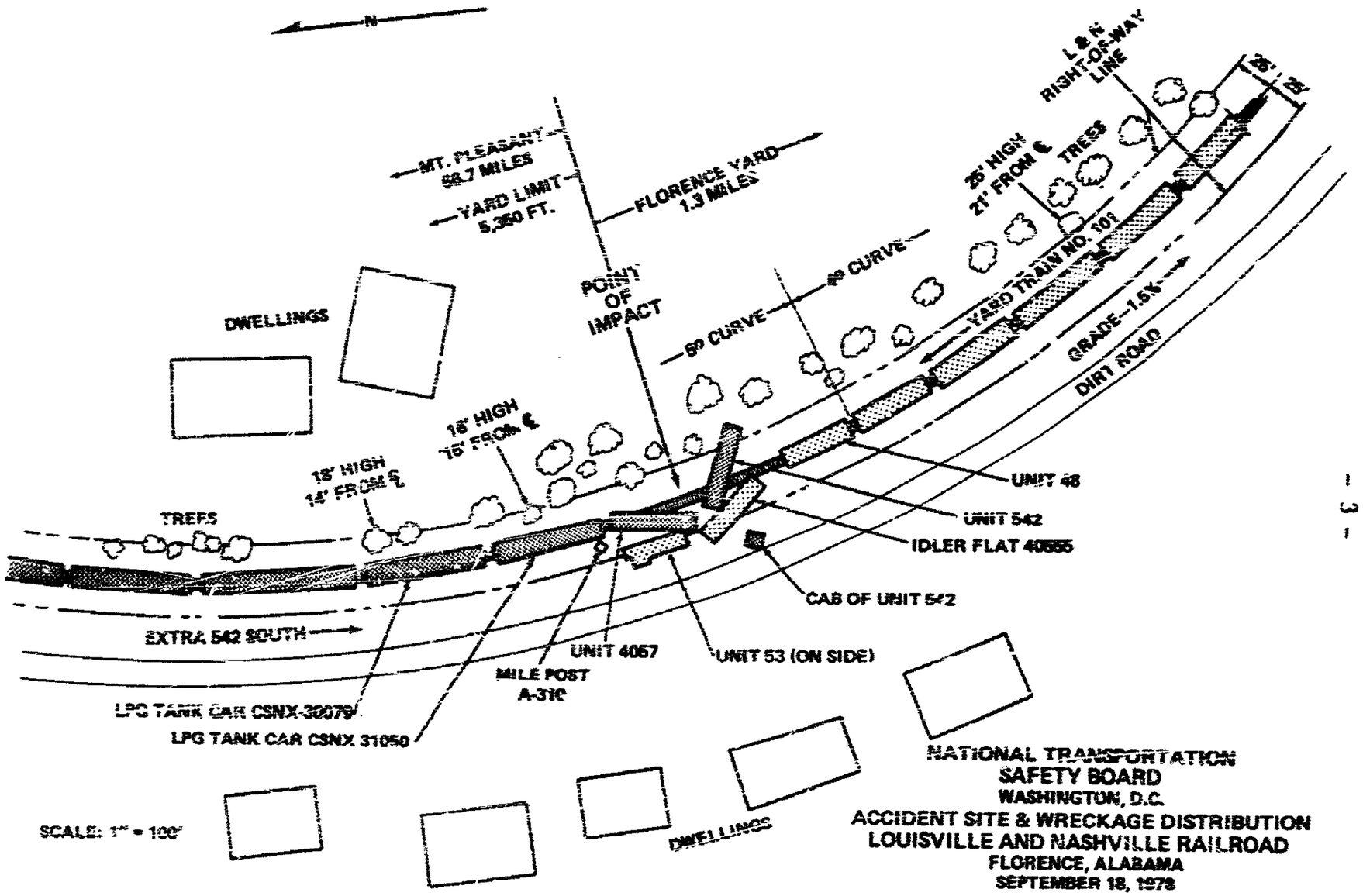

Figure 1. Plan view of accident site and wreckage distribution.

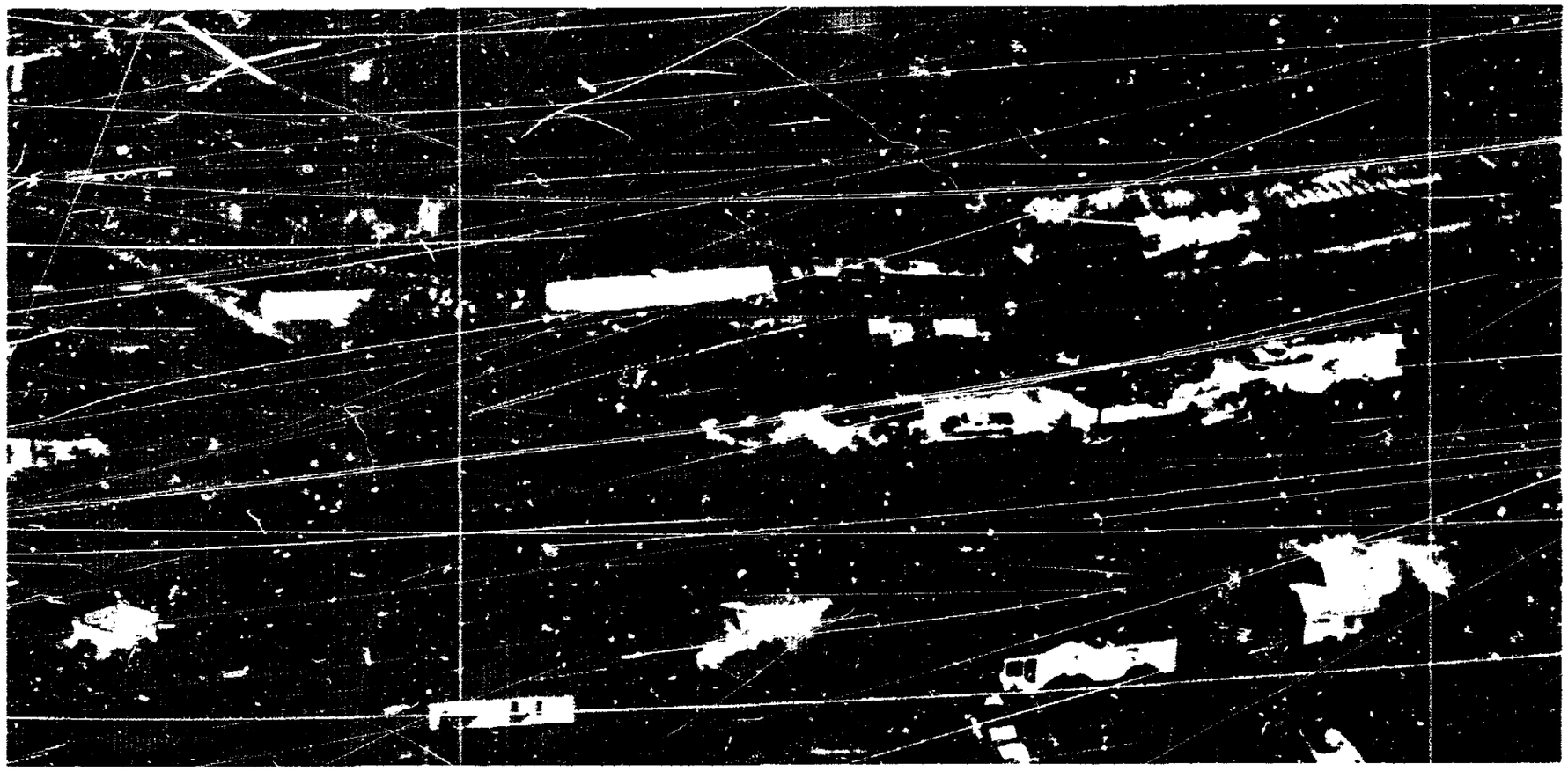

Figure 2. Aerial view of accident location. Extra 542 South is at the left, yard train No. 101 is at the right.

Damage to Train

The lead units of both trains and the idler car of the yard train were derailed and destroyed. The trailing locomotive units of both trains were derailed and damaged. The lead truck of the lead car of Extra 542 South, a placarded DOT 112A400W LPG tank car, was derailed. However, the car was not significantly damaged. About 115 feet of track were destroyed.

Damage was estimated to be as follows:

Train Equipment	$459,700
Track	2,800
Total	$462,500

Crewmember Information

Each of the trains involved in the accident had an engineer, conductor, and two brakemen. All were qualified under L&N operating rules without restriction. All were familiar with the territory and with operations at Florence. The investigation did not reveal any physical condition or restriction on the part of any crewmember involved in the accident. (See Appendix A.)

Except for the head brakeman, the crew of Extra 542 South consisted of extra men working temporary vacancies. The engineer and conductor were working their second trip on the local. Both had been off duty 27 1/2 hours before reporting at 6:00 a.m. on September 18. They had normal bed rest before having breakfast together at 5:25 a.m. The conductor noted nothing unusual about the engineer's behavior then or at any time later. The head brakeman was regularly assigned and was the senior crewmember in point of service. The flagman was working his sixth trip on the Mt. Pleasant-Florence local. He and the head brakeman had been off duty for about 60 hours prior to reporting. Post-mortem toxicological examinations of the engineer and head brakeman were negative for blood alcohol.

All crewmembers of train No. 101 were regularly assigned and had been off duty 62 hours before reporting at 8:00 a.m., September 18. All had normal bed rest the night before. Both brakemen were promoted conductors and had worked as such in relief of the regular conductor. A post-mortem toxicological examination of the conductor was negative for blood alcohol.

Train Information

At the time of the accident, Extra 542 South consisted of 2 diesel-electric locomotive units -- a General Motors Model GP9 leading with short hood forward and a General Motors Model GP38-2 trailing -- 11 cars, and a caboose. After setting off a locomotive unit and block of

cars from the rear of the train at Lawrenceburg, Tennessee, 41 miles north of Florence, the caboose was placed behind the remaining 11 cars. Thereafter, the second car ahead of the caboose was a tank car loaded with anhydrous ammonia and placarded "Non-Flammable Gas." Two cars were set off from the head end en route to the Cities Service siding where two empty, liquefied petroleum gas (LPG) DOT 112A400W tank cars, placarded "Empty-Flammable," were added to the head end. These cars were equipped with top-and-bottom shelf couplers, and they remained coupled at both ends after the collision.

The locomotive of train No. 101 consisted of two Alco Model S-2, switcher-type diesel units. These units had a single hood located ahead of the operator's compartment. A door in the rear cab wall opened to a narrow deck leading to stairwells on both sides. There were windows on both sides of the end door and there was no exterior obstruction to vision. Both units of train No. 101 had the cab ends forward in the direction of movement. The lead unit had a dual sealed-beam headlight above the end door. Four of the six cars in the train had functional airbrakes. One car had inoperative airbrakes, and one car had ineffective airbrakes due to excessive brake cylinder piston travel.

All train crewmembers had access to operable radios. Neither train had a speed recorder and train No. 101 had no speed indicator.

Method of Operation

Florence is the southerly terminus of a branch line known as the Nashville Sub-division of the Birmingham Division. The 58-mile section between Mt. Pleasant and Florence is sirgle track without automatic block signals. Trains are operated by timetable and train orders. Crews are also directed in their operation by radio-transmitted instructions from the dispatcher at Birmingham, Alabama. An operator was on duty at Florence between 7:00 a.m. and 3:00 p.m. His radio had an effective transmitting range of 5 miles. The operator could determine the location of trains beyond that distance by contacting the dispatcher.

The L&N designated Florence as a yard, and defined yard as "A system of tracks within designated limits. . . on which movements not authorized by the time-table, or by train order, may be made, subject to prescribed signals and rules, or special instructions." The north limit of Florence yard was marked with a yard limit sign at Milepost A-309 -- 5,385 feet north of the accident location and 1.3 miles north of the L&N's Florence office. There were no signals or special instructions pertaining to use of the main track. Operations were by L&N rule 93 (see appendix B), which permits use of the main track within yard limits "prepared to stop within one-half the range of vision, but not exceeding 20 mph." As such, the rule complies with 49 CFR 218.35 (see appendix C).

The crew of train No. 101 had a regular reporting time of 8:00 a.m. As the only yard assignment at Florence, this crew did all the industrial switching inside the yard limits. Ordinarily, two coal trains and the Mt. Pleasant-Florence local arrived while the yard crew was on duty. The crew had been verbally instructed to learn the location of inbound trains before going to industries between the yard and the northerly yard limit. On the morning of the accident, they understood that the local and a coal train had yet to arrive. Before leaving for an industrial plant 1.7 miles north of Florence, the head brakeman asked the conductor where the local (Extra 542 South) was. The brakeman said the conductor replied, "I don't know." The yard crew did not attempt to contact the local by radio or to have the operator determine the train's location.

The local freight was operated as an extra daily, except Sunday, from Mt. Pleasant to Florence and return. The crewmembers had a regular reporting time of 6:00 a.m. at Mt. Pleasant and they were required to assemble their train and perform the initial terminal brake test before starting the 136-mile round trip. En route, the train made numerous stops to set off, place, and pick up cars. Maximum authorized speed was 25 mph. On the day of the accident, there were four 10-mph slow orders covering a total distance of more than 7 miles. Providing rules and restrictions were complied with, the one-way trip to Florence would require a minimum of 6 to 7 hours. Following the accident, the L&N abandoned the daily round-trip operation and replaced it with a daily one-way trip with the crew laying over at Florence overnight.

The regular crew usually arrived at Florence between 1:00 p.m. and 3:00 p.m., and it was often necessary to relieve the crew because they did not have enough time under the Hours of Service Act to return to Mt. Pleasant. 2/ The engineer and conductor assigned to the local on the day of the accident had made the previous trip in 6 hours 15 minutes. They had been held off duty at Florence for 8 hours because they did not have enough time to make the return trip. On September 18, the crew had been on duty 4 hours 31 minutes when the accident occurred. En route they had covered one 5-1/2 mile section at an average speed of 34 mph. This section included a 10-mph speed restriction more than 1 mile long and ended with about 1 mile of running inside yard limits.

The flagman testified that on the day of the accident the initial terminal airbrake test did not include observing the brakes apply and release on all the cars as required by L&N Rule 171 (see appendix B). Testimony of the flagman also indicated that road train brake tests required by Birmingham Division Bulletin 17-166 were not properly performed en route (see appendix B). L&N Rule 99, modified by Bulletin 17-74, required the flagman to go 1 mile to the rear of his train, and return, whenever the train was stopped. The crew had not been relieved

2/ Under the Hours of Service Act (49 CFR 228) members of a train crew cannot be on duty engaged in or connected with movement of trains longer than 12 consecutive hours.

of the responsibility to protect their train against a coal train that was to follow them to Florence. The conductor stated that the train was stopped 5 minutes at each of four of the five en route stops. The required flagging protection was not provided.

The Florence operator stated that inbound trains always radio him when they approach the yard limit. No one at Florence heard any radio communication from Extra 542 South on September 18. The conductor and flagman stated they did not attempt to radio Florence and that they did not hear any radio communication from the head end of their train after leaving the Cities Service siding. The crew of Extra 542 South said they were aware that yard train No. 101 was a regular assignment and would be on duty when they arrived at Florence.

Meteorological Information

At the time of the accident it was daylight, clear, and dry. The temperature was 85° F, and winds were light to calm. Ground visibility was 7 miles.

Survival Aspects

The lead unit of train No. 101 overrode the lead unit of Extra 542 South and then turned on its left side. The lead unit of Extra 542 South derailed to the east, but remained upright. This unit absorbed most of the collision impact; both the short hood and operator compartment were torn loose and thrown 30 feet west of the track. (See figure 3.) There was no evidence to indicate the engineer and head brakeman attempted to escape from the cab before the collision. Both received fatal injuries as a result of being ejected and run over by their locomotive. They were found on the track with the engineer under the trailing truck of the lead unit and the brakeman under the lead truck of the trailing unit.

Both the head brakeman and conductor of train No. 101 were able to quickly escape from the lead unit through the end door. The brakeman got off first and was able to scramble uninjured to a ditch west of the track. The conductor followed the brakeman but was killed when the unit turned over on him before he could reach the ditch.

The accident occurred in a residential area. Concern for the derailed LPG tank car and oil spilling from ruptured locomotive fuel tanks prompted civil defense officials to evacuate about 1,000 persons from within the half-mile radius of the accident location. Firemen arrived about 20 minutes after the accident. They dispersed the fuel oil with water and hosed the LPG car until certain it was not leaking. Residents were allowed to return to their homes 5 hours after the accident.

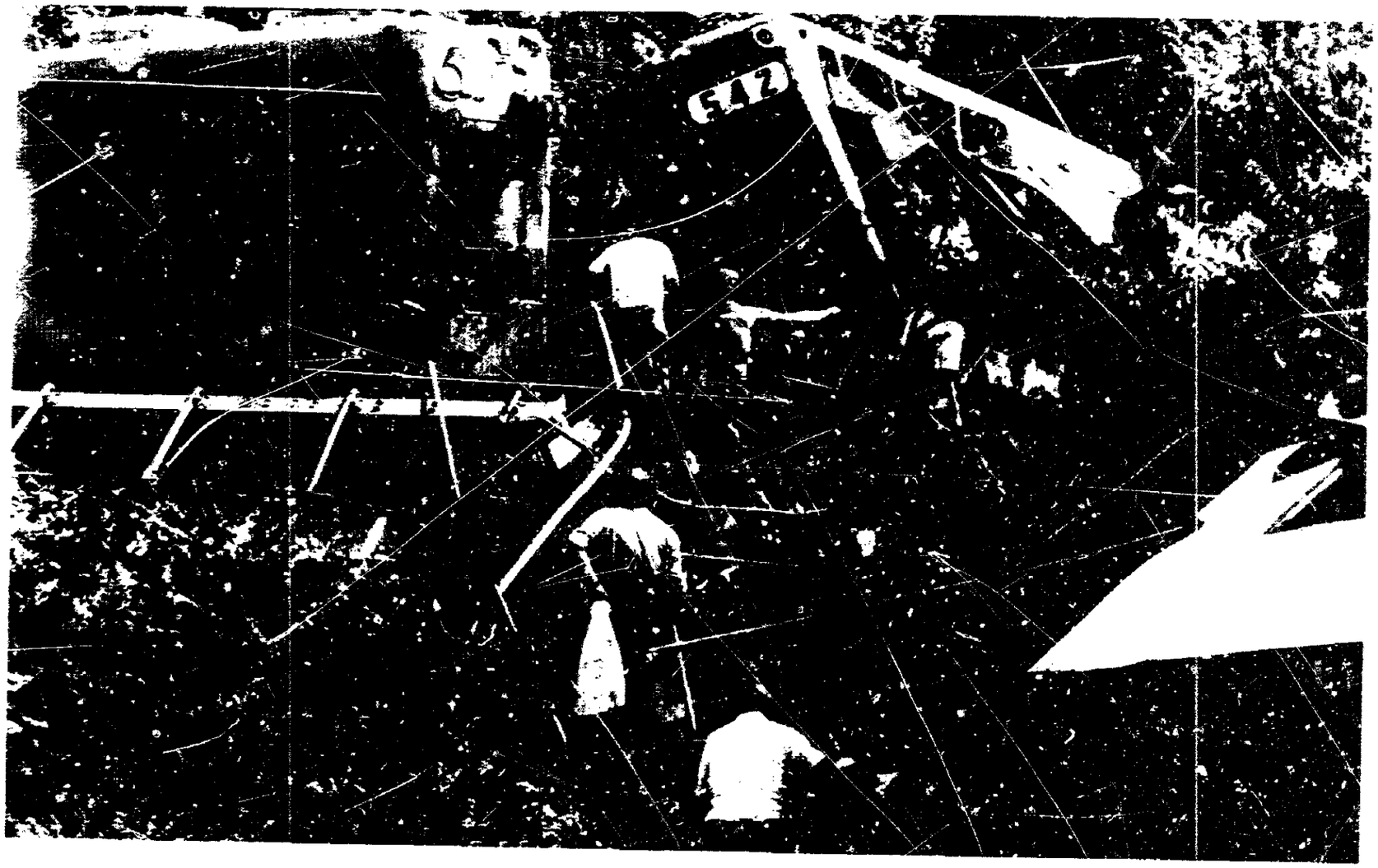

Figure 3. The accident location viewed from the west. The operator compartment of the lead unit of Extra 542 South is in the right foreground. The overturned lead unit of yard train No. 101 is at the lower left, partly obscured by foliage. Between unit 542 and its cab is the yard train's idler car.

Tests and Research

Postaccident stopping tests indicated that, allowing for 1.5-second perception/reaction time, Extra 542 South required about 250 feet to stop at 15 mph and about 133 feet at 10 mph. Using the same perception/reaction allowance, train No. 101 needed at least 93 feet to stop at 10 mph and 153 feet at 15 mph.

The brake systems of both trains were tested. Ten cars of Extra 542 South had functional brakes and one car had brake cylinder piston travel of 11 1/2 inches. Four of the six cars of train No. 101 had functional brakes, one car had inoperative brakes, and the other car had cylinder piston travel of 10 1/2 inches. Title 49 CFR 232.11(c) stipulates that car brakes are ineffective when brake cyliner piston travel exceeds 10 inches.

Other Information

Trackside Foliage -- Throughout the entire 1,500-foot length of the curve at the accident site, the L&N right-of-way extends for 25 feet on each side of the main track centerline. Beginning at a point 200 feet south of the north end of the curve and ending 600 feet north of the south end of the curve, there were trees in full foliage encroaching upon the right-of-way east of the track on the inside of the curve. These trees varied in height from 15 to 35 feet above the top of the rail and materially reduced the range of vision. The most critical encroachment was at a point 450 feet south of the point of curve and 100 feet north of the point of collision, where 35-foot trees were only 14 feet from the track centerline. (See figures 4 and 5.)

Supervision and Training -- The L&N Nashville Sub-division was supervised by a 31-year-old trainmaster headquartered at Columbia, Tennessee, 11 miles north of Mt. Pleasant. The trainmaster entered L&N service as a brakeman in 1969 and in 1970 he received an appointment in an L&N sales office. He subsequently served in the L&N's system service center where he was concerned with customer service, union grievances, caboose utilization, and similar assignments. In April 1975, he returned to the operating department as assistant trainmaster at Nashville and was promoted to trainmaster at Columbia on June 1, 1977. The trainmaster received virtually all of his training as an operating department supervisor on the job. He had not participated in L&N's formal supervisor training program.

Although subject to the authority of the division superintendent at Birmingham, the trainmaster was in charge of operations on the Nashville Sub-division. His responsibilities included the scheduling, operation, and performance of trains, training new employees, and the annual examination of all train and engine service employees on rules and restrictions. He

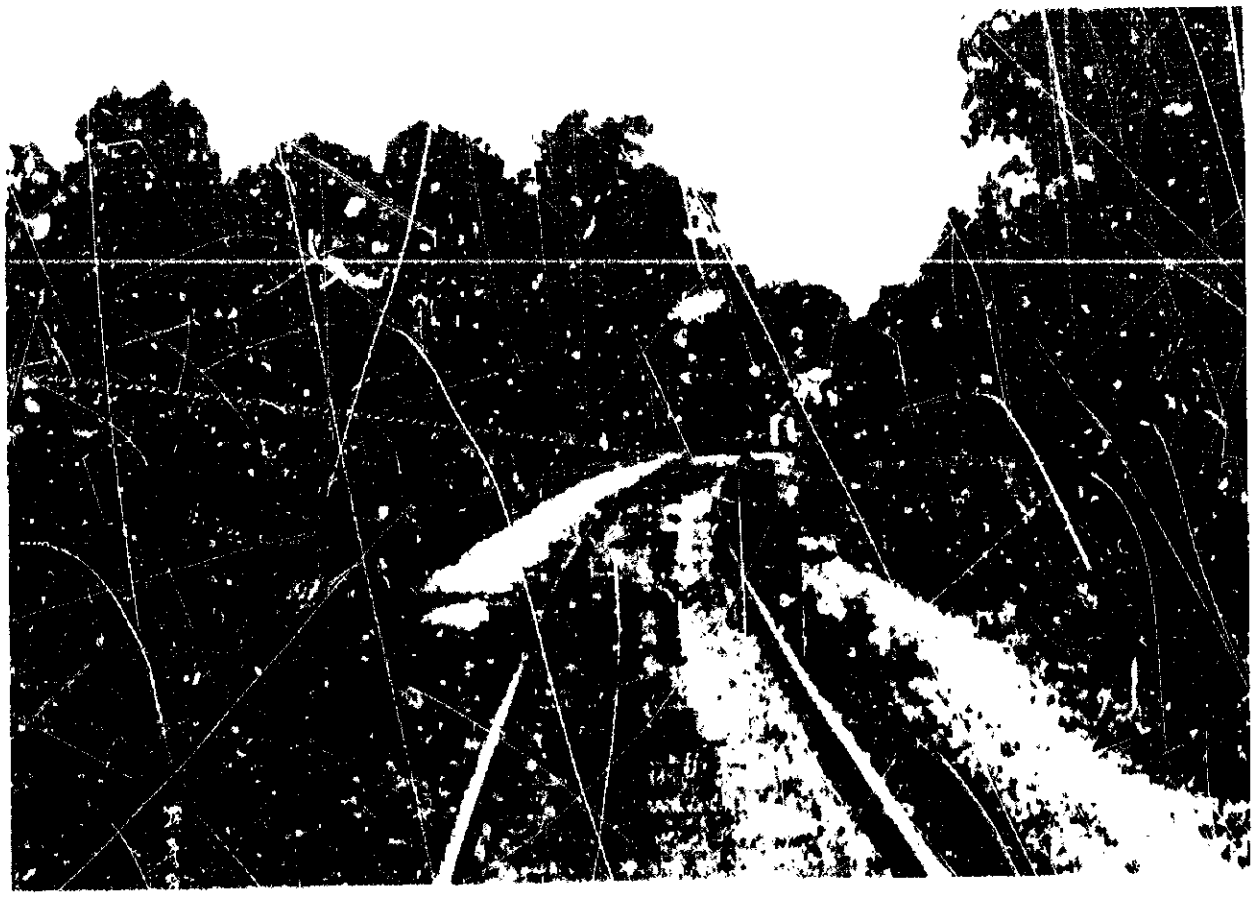

Figure 4. View of track to the south from a point 375 feet north of the accident site.

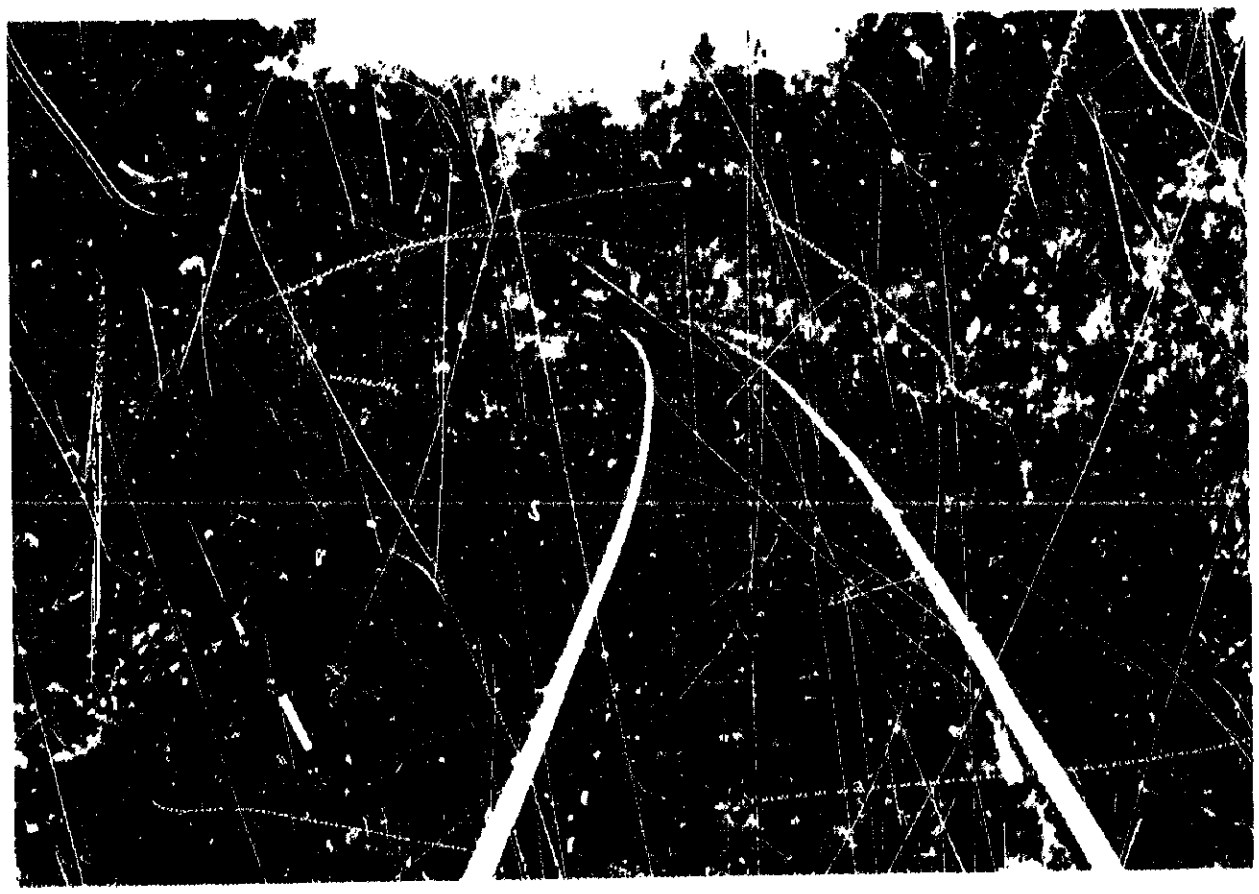

Figure 5. View of track to the north from a point 300 feet south of the accident site.

was required to periodically monitor the performance of train crews and check their compliance with rules. He was also required to handle unsafe operating conditions for correction and could recommend the issuance of bulletins and timetable instructions pertaining to the subdivision.

The L&N's current locomotive engineer training program was instituted in 1966 and is headed by a manager of locomotive engineer training. It is implemented on a local basis by the division road foremen of engines acting as instructors. Trainees also receive instruction on operating rules from the division trainmasters. In addition to local facilities, a traveling classroom with simulator is used. The prescribed course of instruction embraces 16 hours (2 days) of orientation, 312 hours (39 days) of classroom instructions, and 1,200 hours (150 days) of qualifying, on-the-job training. A job knowledge test is given to each trainee prior to qualification. Once qualified, engineers are retrained through annual rules classes conducted by the trainmasters. Revalidation of proficiency is accomplished through random supervisory efficiency checks, according to the L&N.

All crewmembers involved in the accident received instruction and written examinations on operating rules and the timetable in February 1978. The classes were conducted by the trainmaster who also composed the examination questions. The L&N rules examiner advised the trainmaster what rules he should cover, but uniform questions or interpretations of the rules were not provided. The one question relating to Rule 93 did not require the definition of yard speed but rather asked for the maximum allowable speed within yard limits. The examination did not include any questions on handling and placement of hazardous material cars.

Between August 1, 1977 and August 31, 1978, 77 recorded efficiency tests were made by supervisors on the Nashville Sub-division between Columbia and Florence. Eleven of these were Rule 93 compliance tests, including four made at Mt. Pleasant and one at Lawrenceburg. The tests were made with radar speed detectors at locations of unrestricted visibility. One violation was recorded--a coal train moving at 23 mph. No tests or observations of hazardous materials handling were recorded. No Rule 93 test was made at Florence. Although conductor's delay reports revealed crews were not complying with Rule 99, supervisors never observed such violations.

The last recorded efficiency checks at Florence were made by the assistant trainmaster in 1977. In August a freight crew was checked on compliance with a timetable requirement to flag a crossing. In October the yard crew was checked on rules requiring the carrying of the current timetable, having watch inspection cards, and comparison of watch time with the standard clock.

Of the five surviving train crewmembers, two remembered a supervisor riding with them while they were on duty. The yard engineer recalled a former trainmaster riding with him about 2 1/2 years earlier and the conductor of Extra 542 South stated that the assistant trainmaster had ridden with him on a coal train 3 or 4 months before the accident.

According to Birmingham Division supervisors, the disciplinary system used did not provide for actual suspension short of outright dismissal. Unless a serious accident resulted from a violation, a formal hearing or investigation was not held as long as the employee admitted his responsibility. Employees could be held responsible for three or more successive violations before dismissal would be considered. To avoid dismissing a violator, he would be given "personal handling" by the trainmaster without entry in his service record, according to the supervisors. If an employee was dismissed, it was the policy to reinstate him within a year or less on a leniency basis.

Previous Accident -- On July 8, 1978--2 months before this accident--the Mc. Pleasant-Florence local freight train collided head-on with a coal train near St. Joseph, Tennessee, 22 miles north of Florence. Before leaving Florence, the local's crew failed to perform the required brake test, radio test, time check, and bulletin check. The L&N did not discipline the crew for the violations and did not initiate a corrective program of rules training and enforcement.

Tank Car Placement -- 49 CFR 174.83 prohibits the placement of a placarded, empty tank car, other than one placarded "combustible," nearer than the second car from the engine of a train. Title 49 CFR 174.91 prohibits placement of a placarded, loaded tank car, other than one placarded "combustible," nearer than the sixth car from an occupied caboose of a train. These regulations, together with the mandatory use of an entirely new series of hazardous materials placards, became effective January 1, 1977.

None of the surviving train crewmembers or their supervisors understood the requirements for placement of placarded tank cars. The current Birmingham Division timetable went into effect on October 31, 1976. Its instructions on the handling, placement, and placarding of hazardous materials cars have been obsolete since January 1, 1977. (See appendix C.) The L&N had not issued a bulletin or general order to modify the timetable's instructions to include the new regulations. After the accident, L&N's director of transportation training-rules examiner stated that the hazardous materials instructions were considered "advisory" and did not need to be updated or modified until a new timetable was issued.

ANALYSIS

From the time they reported at Mt. Pleasant on the day of the accident the crew of Extra 542 South repeatedly violated rules and restrictions relating to the safe operation of their train. According to the evidence, they performed only an abbreviated initial terminal airbrake test, ran at excessive speed, and failed to protect their train whenever it stopped. The maximum 12 hours they were allowed to be on duty was not long enough for them to make the entire 136-mile round trip, do all the required work en route, and still observe the speed restrictions and operating rules. The crew probably did not want to be held over in Florence for 8 hours as they had on their previous trip. To be sure of returning to Mt. Pleasant before 6:00 p.m., they would have to arrive at Florence before noon.

Approaching Florence, the crew of Extra 542 South understood that yard train No. 101 was on duty and could be occupying the main track anywhere inside the yard limit. Yet, they failed to radio the Florence operator as was customary. The engineer should have known that the descending grade would increase his stopping distance at a location where sight distance was critically limited. Because the engineer's vision was reduced to about 375 feet approaching the collision point, the train's speed should have been reduced to permit stopping in 187 feet or less to comply with Rule 93. Tests showed that at 15 mph, the train would have required 250 feet to stop, providing the engineer perceived yard train No. 101 where it could first be seen by him. The engineer's failures to apply his train's brakes in emergency and to attempt an escape from the locomotive unit indicate that he did not perceive the yard train before the collision.

The crew of yard train No. 101 knew the territory and they knew the local could arrive at any time. Nevertheless, the conductor failed to have the Florence operator determine the location of the local freight, even after his brakeman expressed concern, and ordered his crew out of the yard. The conductor was in charge and the other crewmembers apparently were reluctant to question his judgment. However, any one of them could have called the operator on his radio and established communications that would have prevented the accident.

The testimony of the engineer and other crewmembers, coupled with the results of the postaccident stopping distance tests, indicated that train No. 101 was being operated in compliance with Rule 93. Nevertheless, this did not prevent the accident nor did it even insure the survival of all members of the crew. Rule 93 is inadequate as a safeguard at the accident location because it relies entirely on the judgment of the engineers, as well as their ability to correlate stopping capability, distance, and

gradient and then to correctly adjust speed accordingly. It is unreasonable to assume that engineers have this ability, especially inside yard limits, where the rule is intended to cover every conceivable situation. If Rule 93 failed to provide adequate safeguards at the accident location, then special instructions as provided for in the rules should have been implemented.

There is substantial difference between the program the L&N says it uses to train its student engineers and that which was completed by the engineer of Extra 542 South. Although the prescribed course was the equivalent of more than 23 weeks in length, the engineer was qualified in 8 weeks. This included only about 8 days of orientation and classroom instruction compared to the 41 days provided for in the program. The engineer had no training in a locomotive simulator or instruction vehicle. Practically all of his on-the-job training was received from other engineers.

The trainmaster understood the hazardous nature of the curve at Florence, because he had instructed the yard crew to learn the location of inbound trains before leaving the yard and he knew that inbound crews customarily contacted the operator by radio as they approached Florence. Yet, these precautionary measures were never formally incorporated into the timetable or bulletin instructions. Since all crews and the operator had radios, the trainmaster could have easily established a procedure to insure positive control over trains moving through the hazardous location. Instead, he relied on Rule 93 and its dependence on the judgment and ability of his engineers. Compounding the problem were the trainmaster's practice of emphasizing the 20-mph maximum speed provision in his rules examinations and his failure to conduct Rule 93 compliance tests where visibility was limited. The Safety Board concludes that the net effect was to create the general impression among train crewmembers that 20 mph was the required speed within yard limits.

An apparent lack of concern on the part of their supervisors coupled with a permissive disciplinary system gave the crew of Extra 542 South little cause to worry about being reprimanded for violating rules and restrictions. They seldom saw supervisors south of Mt. Pleasant and efficiency checks were rarely made in the area. Despite a head-on collision 2 months before, there had been no change in the situation. Even if they could expect to be observed en route, the Safety Board believes that the crewmembers probably would not have changed the way they worked. For example, the engineer had missed a call to duty and had been observed speeding, but only the missed call resulted in a mark against his record (see appendix A). The head brakeman had been observed sleeping on duty but had not been disciplined. Moreover, he had missed most of the questions on his last rules examination but had not been restricted in any way (see appendix A).

When serious rules infractions receive only "personal handling" without mention in their service records, employees are likely to decide such infractions are not really serious. Even when accidents occurred as a result of violations, there was no provision for actual suspension from service. Chronic violators might eventually be dismissed, but they could count on quick reinstatement.

The trainmaster was in charge of the subdivision and he was responsible for all facets of its operation, including the realistic scheduling of trains and the recognition of unsafe operating practices. He was also expected to train, evaluate, and monitor the employees working under him. The system of discipline afforded him much discretion in this area as well. The Safety Board believes that the trainmaster's preparation for this wide range of responsibility was inadequate, particularly since it did not include the training afforded by L&N's formal program for operating supervisors. Nevertheless, the trainmaster was given broad freedom and flexibility. He was allowed to interpret, teach, and enforce the rules as he saw fit without being given uniform guidelines to follow. There can be no uniform understanding of what is required when line supervisors are given unlimited freedom of action in this area. If safety was not paramount among the trainmaster's priorities, it was because management failed to motivate him adequately.

At the time of the accident, Extra 542 South included a placarded tank car of anhydrous ammonia two cars ahead of the caboose, and a placarded empty LPG tank car next to the locomotive. Placement in both instances was in violation of Federal regulations. Inasmuch as the L&N management had failed to modify obsolete timetable instructions to conform with Federal hazardous materials regulations, the crew and their supervisors could not be expected to know what the regulations required. The failure apparently resulted from the impression that the regulations were "advisory" and not binding. Fortunately, the two LPG cars at the head end of the train were equipped with top-and-bottom shelf couplers and did not separate, become misaligned, or have their tanks punctured.

This accident was another in a long series of accidents demonstrating the tendency for conventional, general-purpose locomotive units to be overridden in low-speed collisions with disastrous effect to the superstructure. The operator compartment of the lead unit of Extra 542 South provided absolutely no protection to the men inside it. They either chose to remain in place or were unaware of the impending accident until it was too late to escape. As a result, they had no chance to survive the collision.

The Safety Board has repeatedly pointed out the poor crashworthiness of locomotive cabs. In its 1971 report on an accident at Sound View,

Connecticut, 3/ the Safety Board recommended that the Federal Railroad Administration (FRA):

> ...continue to a conclusion its recently initiated efforts in the matter of the improvement of the design of locomotive operator compartments to resist crash damage, and, in conjunction with the Association of American Railroads, undertake a review of modern design crashworthiness concepts in an effort to identify areas of applicability in the railroad industry.

The recommendation was reiterated in 1972, following another accident. In response, FRA advised that an industrywide committee had been formed to make a cab crashworthiness study. In its June 8, 1978, report on an accident at Goldonna, Louisiana 4/, the Safety Board observed that "the committee has not produced any significant improvement in cab design" and recommended that the FRA:

> Quickly conclude its study of improvements to the design of locomotive operator compartments to maximize crash damage, and promulgate necessary regulations to assure the adoption of appropriate findings.

To date the FRA has not advised the Safety Board of any new findings by the committee.

CONCLUSIONS

Findings

1. During the course of their trip, the crew of Extra 542 South repeatedly failed to comply with rules and restrictions relating to airbrake tests, speed, and the protection of their train.

2. The engineer of Extra 542 South was qualified under L&N rules and was familiar with the accident location.

3. Extra 542 South had operable radios on locomotive and caboose, but the crew failed to communicate with the Florence operator as was customary.

3/ "Railroad Accident Report: Penn Central Transportation Company Freight Train Derailment and Passenger Train Collision with Hazardous Material Car, Sound View, Connecticut, October 8, 1970" (NTSB-RAR-72-1).

4/ "Railroad/Highway Accident Report: Collision of a Louisiana & Arkansas Railway Freight Train and a L. V. Rhymes Tractor-semitrailer at Goldonna, Louisiana, December 28, 1977" (NTSB-RHR-78-1).

4. The engineer of Extra 542 South was operating his train at a speed in excess of that which would comply with Rule 93.

5. The engineer of Extra 542 South probably did not perceive yard train No. 101 where it could first be seen by him, nor did he apply his train's brakes in emergency.

6. Although the crew of yard train No. 101 knew the local could arrive at any time, they did not attempt to learn its location before they left Florence Yard.

7. The engineer of yard train No. 101 was operating the train in compliance with Rule 93.

8. None of the train crewmembers or their supervisors understood, nor had they been instructed about, current regulations regarding placement and handling of hazardous materials cars.

9. The timetable in effect at the time of the accident contained obsolete hazardous materials instructions. It had never been modified to reflect current regulations and placards now in mandatory use.

10. If Rule 93 failed to provide adequate safeguards at the accident location, then special instructions as provided for in the rules should have been implemented.

11. Training provided employees regarding Rule 93 emphasized the 20-mph maximum speed provision rather than the ability to stop in limited visibility situations.

12. Supervisors failed to monitor Rule 93 compliance in locations with limited visibility where a speed of less than 20 mph was required. No Rule 93 tests were made at Florence since modification of the rule in 1977.

13. The trainmaster was allowed to interpret, teach, and enforce the rules as he saw fit. There can be no uniform understanding of what is required when line supervisors are given unlimited freedom of action in this area.

14. The course of training and qualification of the engineer of Extra 542 South did not conform with the prescribed policy of the Louisville and Nashville Railroad.

15. Although two trains collided head-on near Florence in July 1978, no corrective program of training and enforcement of rules was instituted on the Nashville Sub-division.

16. At the time of the accident, Extra 542 South had a placarded tank car of anhydrous ammonia two cars ahead of the caboose in violation of 49 CFR 174.91, and a placarded, empty LPG tank car next to the locomotive in violation of 49 CFR 174.93.

17. The two LPG tank cars next to the locomotive were equipped with top-and-bottom shelf couplers which probably prevented the uncoupling, overriding, and puncture of these cars.

18. The inability of the local's lead unit to resist overriding and low-speed impact resulted in destruction of the operating compartment and the fatal injuries to the men inside it.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer of Extra 542 South to operate his train at a speed that would have permitted stopping the train within one-half the available sight distance as required by L&N operating rules. Contributing to the severity of the accident was the failure of the engineer of Extra 542 South to apply his train's brakes after he was in a position to see the opposing train. Contributing to the collision was the failure of the L&N management to insure that all operating rules were being complied with, particularly those involving the operation of two trains in opposite directions on the same track.

RECOMMENDATIONS

As a result of its investigation of this accident, the National Transportation Safety Board made the following recommendations:

...to the Louisville and Nashville Railroad Company:

"Take immediate steps to insure that its train operations are conducted in accordance with its operating rules. (Class II, Priority Action)(R-79-6)

"Provide supervisors and employees periodic, supervised training that is based on a uniform understanding of rules and regulations. (Class II, Priority Action)(R-79-7)

"Correct its timetable instructions on handling and placement of hazardous materials cars so that they comply with current Federal regulations. (Class II, Priority Action)(R-79-8)

"Include in the required supervisory efficiency and safety checks the monitoring of compliance with hazardous materials regulations. (Class II, Priority Action)(R-79-9)"

...to the Federal Railroad Administration:

"Insure that the Louisville and Nashville Railroad Company complies with the requirements of 49 CFR 174, Transportation of Hazardous Materials; 49 CFR 232, Railroad Power Brakes; and 49 CFR 217, Railroad Operating Rules, particularly in connection with the application and enforcement of L&N rules 93 and 99. (Class II, Priority Action)(R-79-10)

"Expedite action on Recommendation R-78-27 of June 8, 1978, relating to its study of locomotive operator compartment design to minimize crash damage and promulgation of appropriate regulations. (Class II, Priority Action)(R-79-11)"

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vic Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PHILIP A. HOGUE
Member

February 22, 1979

APPENDIX A

TRAIN CREWMEMBER INFORMATION

EXTRA 542 SOUTH

Conductor Stanley Alton Watson

Conductor Watson, 31, was employed as a brakeman by the Louisville and Nashville Railroad on May 1, 1973, and was promoted to conductor on June 6, 1975. Assigned to the conductor's extra board, he worked in Birmingham Division freight train service as needed. Watson first worked as conductor on the Mt. Pleasant - Florence local on September 16, 1978, and was making his second trip on that assignment at the time of the accident. However, he had previously worked in and out of Florence and was familiar with the territory. Watson's last physical examination was on December 2, 1975, at which time his eyesight was 20/20 in both eyes and his hearing was 20/20 in both ears. There were no negative findings or restrictions.

The only infraction noted in Conductor Watson's record was a February 1976 derailment for which he received "personal handling" in lieu of formal discipline. Watson passed a written examination on L&N operating rules on February 3, 1978, and was considered fully qualified without restrictions.

Engineer David Clark Alexander

Engineer Alexander, 28, was employed as a brakeman by the Louisville and Nashville Railroad on June 19, 1972. He worked various Birmingham Division freight train assignments as needed until November 1974 when he applied for and began training as a locomotive engineer. Alexander's period of instruction and qualification lasted about 8 weeks and included about 8 days of classroom instruction from the division road foreman of engines. The balance of the training consisted of road trips made with pool engineers. No record of the trips was kept, but the road foreman of engines who instructed and qualified Alexander stated that he probably made 5 trips a week during the training period. This was limited to 60 days as this is the longest leave of absence that can be given to a brakeman without loss of seniority. Alexander had no training in a locomotive simulator or instruction car. According to the road foreman, Alexander passed a job knowledge test prior to being qualified, but no record was kept of his score. He was qualified as an engineer in road and yard service on January 15, 1975, after which he was instructed and examined on operating rules by the division trainmaster.

Alexander received a physical examination in June 1972. At the time his vision was 20/20 in both eyes, and his hearing was 20/20 in both ears. There were no adverse findings or restrictions.

On August 6, 1976, Alexander was cited for "exceeding normal speed" while operating a train. He admitted full responsibility and no formal investigation was conducted. A 45-day "record" suspension was assessed but was never entered in Alexander's service record. Failure to protect an assignment (missing duty) on June 6, 1977, resulted in a 30-day record suspension which was posted to the service record. Alexander passed a written examination on L&N operating rules on February 1, 1978, and was considered fully qualified without restrictions.

Head Brakeman James Thomas Hampton

Brakeman Hampton, 31, was employed as a brakeman by the Louisville and Nashville Railroad on December 11, 1972. He was not promoted. Hampton was regularly assigned as head brakeman to the Mt. Pleasant-Florence local and had last worked the assignment on September 15, 1978.

Hampton had been cited and disciplined for numerous rules infractions. On March 6, 1973, he was given a 30-day record suspension for failing to line a crossover switch; the failure resulted in an engine derailment. Later in 1973, he twice failed to protect his assignment and was given successive 45-day and 60-day record suspensions. On May 14, 1974, he was observed sleeping on duty and, since following the prescribed disciplinary course would require dismissal, he was given "personal handling" without any formal entry in his personal record. After receiving another 60-day record suspension for dishonesty, Hampton was dismissed on August 17, 1974, for leaving a main track switch open. Reinstated on a leniency basis on February 4, 1975, Brakeman Hampton was given yet another 60-day record suspension for his responsibility in an engine derailment on September 7, 1975.

At the time he was employed, Hampton was examined and found to have 20/20 vision in both eyes and 20/20 hearing in both ears. He had no known physical restrictions.

On February 1, 1978, Hampton took a written examination on the L&N operating rules. He missed all or part of 42 of the 50 questions including most of those pertaining to train orders. Hampton was reexamined orally by the trainmaster on February 5, 1978, and was allowed to remain in service without restrictions. According to the trainmaster, Hampton knew the rules but could not comprehend written questions or instructions.

Flagman William Eugene Whitwell

Flagman Whitwell, 27, was employed as a brakeman by the Louisville and Nashville Railroad on February 18, 1977. He was not promoted. Assigned to the trainmen's extra board, he worked in Birmingham Division freight service as needed. Whitwell's most recent physical examination was on February 18, 1977, at which time he had 20/20 vision in both eyes; hearing was 20/20 in both ears. There were no negative findings or restrictions.

Brakeman Whitwell's record revealed no infraction of rules or disciplinary action. On February 10, 1978, he passed an examination on the L&N operating rules with a perfect score. Whitwell was considered fully qualified without restrictions.

YARD TRAIN NO. 101

Conductor Leonard Louis Johns

Conductor Johns, 52, was employed as a brakeman by Louisville and Nashville Railroad on July 8, 1948, and was promoted to conductor on February 18, 1961. He was regularly assigned as the conductor of yard train No. 101 and had worked on this crew for at least 15 years prior to the accident.

Johns received various terms of record suspension following accidents for which he was responsible on December 12, 1963; January 14, 1967; September 19, 1972; and June 8, 1973. He was also cited but not disciplined for improper use of the radio on May 14, 1968. On December 3, 1973, he was responsible for a derailment and given personal handling without mention in his service record. Johns was dismissed on December 8, 1975, for his improper radio communication procedures resulting in a derailment and damage to an industrial plant. He was reinstated on a leniency basis on March 16, 1978.

There is no known record of Johns ever having received a company physical examination. Reportedly, he had no physical restrictions or disabilities other than his eyesight for which he wore corrective eyeglasses.

Johns was last examined on operating rules by the division trainmaster on February 14, 1978.

Engineer Gentry Bruce Tucker

Engineer Tucker, 54, was employed by the Louisville and Nashville Railroad as a fireman in March 1947, and was promoted to engineer on June 1, 1968. He had been the regularly assigned engineer on yard train No. 101 for about 2 1/2 years. Prior to that time he was assigned to the Mt. Pleasant - Florence local freight. He last worked prior to the accident on September 15, 1978.

The only infraction in Engineer Tucker's service record was the 1975 accident involving Conductor Johns and improper radio procedure. As with the conductor, Tucker was dismissed on December 8, 1975, and he was reinstated on a leniency basis on March 4, 1976.

Engineer Tucker's last known physical examination, on August 11, 1975, resulted in no adverse findings or restrictions. At the time he had 20/40 vision in the right eye, 20/30 vision in the left eye, and 20/20 hearing in both ears. He needed and wore glasses to read.

Tucker passed a written examination on L&N operating rules on February 14, 1978.

Head Brakeman Terry Don Misenhimer

Brakeman Misenhimer, 31, was employed by the Louisville and Nashville Railroad as a brakeman on November 29, 1972. He was promoted to conductor in July 1977. Since December 19, 1977, he was regularly assigned to yard train No. 101 as head brakeman.

Misenhimer's service record shows no infractions of rules. He received a physical examination on November 27, 1972, at which time his eyesight was 20/20 in both eyes and his hearing was 20/20 in both ears. There were no adverse findings or restrictions.

Brakeman Misenhimer passed a written examination on L&N operating rules on February 14, 1978, and was considered fully qualified without restrictions.

Brakeman Paul Anderson Dodd

Brakeman Dodd, 42, was employed by the Louisville and Nashville Railroad as a brakeman on June 8, 1967. He was promoted to conductor about 1972. Since 1973, Dodd has been regularly assigned to yard train No. 101 as rear brakeman and he has worked the assignment of conductor as needed. His right ankle was fractured on April 7, 1971, and a physical examination on June 4, 1971, qualified him to return to work as a brakeman without restriction. At the time, he had "slight limitation of motion in right ankle," 20/20 vision in both eyes, and 20/20 hearing in both ears. There were no adverse findings.

Dodd admitted responsibility for derailments on October 22, 1968, December 3, 1973, and March 7, 1977. In the first and third instances he received 30- and 45-day record suspensions, respectively. In the 1973 instance, he received personal handling without mention in his service record. Dodd passed a written examination on L&N operating rules on February 14, 1973, and he was considered qualified without restriction.

APPENDIX B

Excerpts from Operating Rules of The Louisville and Nashville Railroad Company

93. Within yard limits main track may be used and all trains must move on main track within yard limits prepared to stop within one-half the range of vision but not exceeding 20 miles per hour unless the track is known to be clear by automatic block signal indication.

99. When a train is moving on a main track at less than one-half the maximum speed for that territory, flag protection against following trains on the same track must be provided by a crew member dropping off single lighted fusees at intervals that do not exceed the burning time of the fusee.

When a train is moving on a main track at more than one-half the maximum speed for that territory, under circumstances in which it may be overtaken by a following train, crew members responsible for providing protection will take into consideration the grade, curvature of track, weather conditions, sight distance, and relative speed of their train to a following train and will be governed accordingly in the use of fusees to protect their train.

When train stops on a main track, flag protection against following trains on the same track must be provided. A crew member with flagman's signals must immediately go back at least the distance prescribed by time-table or other instructions for that territory, place two torpedoes on the rail not less than 100 feet apart and display one lighted fusee. He may then return one-half of the distance to his train where he must remain until he has stopped a following train or is recalled or relieved.

When the safety of the train will permit, he will be recalled sufficiently in advance of departure so that train will not be unnecessarily delayed. When recalled and no following train is seen or heard, he must leave a lighted fusee before returning to his train. If full flagging distance has not been reached when flagman is recalled and an approaching train is not seen or heard, he will immediately place two torpedoes on the rail not less than 100 feet apart and leave a lighted fusee before returning to his train. When returning to his train, he must leave lighted fusees at intervals that do not exceed the burning time of the fusee. When train departs, crew member must leave a lighted fusee and drop single lighted fusees at intervals that do not exceed the burning time of the fusee until train attains a speed not less than one-half the maximum authorized speed for that territory.

Crew members providing flag protection must not permit other duties to interfere with the protection of their train. The conductor and engineer are responsible for the protection of their train.

When a train requires protection the engineer must immediately sound signal Rule 14(c). Inability to hear the signal does not relieve members of the crew from protecting the train.

Flag protection against following trains on the same track is not required under the following conditions:

(a) In block signal territory, when rear of train is protected by at least two block signals, except a reverse movement in Automatic Block Signal System limits, and a reverse movement not authorized by train dispatcher in Centralized Traffic Control System limits must be made under flag protection.

(b) When rear of train is protected by an absolute block. (Absolute block means a block in which no train is permitted to enter while it is occupied by another train.)

(c) When rear of train is within interlocking limits.

(d) When a train order or special instructions provides that flag protection is not required.

Rev. 5-1-77

AIR BRAKES

171. All trains must be given inspection and test at the initial terminal of the train and at designated intermediate points, such intermediate points not to exceed 500 miles from inspection and test point. During standing tests, brakes must not be applied or released until proper signal is given.

In making initial terminal inspection and test of road freight trains, after air brake system is charged to within 15 pounds of setting of the feed valve on the locomotive as indicated on gauge at rear of train, a 15 pound brake pipe reduction must be made and the number of pounds of leakage per minute noted, after which brake pipe reduction must be increased to full service. Inspection must be made to determine that the brakes are applied on each car, that piston travel is correct, that brake rigging does not bind or foul and that all parts of brake equipment are properly secured. When the inspection has been completed and brakes released, inspection must be made to see that all brakes have released. Brake pipe leakage must not exceed 5 pounds per minute.

SOUTHWARD — COLUMBIA AND SHEFFIELD — NORTHWARD

SECOND CLASS					TIME-TABLE No. 17 Takes effect Sunday October 31, 1976 12:01 a.m. Central Standard Time		SECOND CLASS			
398	351	337	345	Distance from Louisville		Car Capacity of Sidings	344	[illegible]	336	352
Freight	Freight	Freight	Freight				Freight	Freight	Freight	Freight
Daily ex. Sat.	Daily ex. Sunday	Daily	Daily ex. Sunday		STATIONS		Daily ex. Sunday	Daily ex. Sunday	Daily	Daily ex. Sunday
P.M.	P.M.	P.M.	A.M.				A.M.	P.M.	P.M.	P.M.
	5.30		7.30	232.53	L COLUMBIA O A .60	Yard	10.20			8.10
6.58	5.35	2.55	7.35	233.13	COLUMBIA WYE 4.58		10.15	2.55	6.58	8.05
7.00	5.50	3.05	7.50	237.71	SIGLO 5.63	Branch Wye	10.00	2.45	6.40	7.50
7.10		3.20		243.34	MT. PLEASANT 25.19	Yard		2.30	6.30	
8.15				268.53	LAWRENCEBURG 42.77	28		1.20		
10.00				311.30	A FLORENCE O L 1.00	Yard		11.20		
				312.30	FURNACE JCT. 2.85					
				315.15	SHEFFIELD JCT. 1.23					
				316.38	SHEFFIELD					
P.M.	P.M.	P.M.	A.M.				A.M.	A.M.	P.M.	P.M.
Daily ex. Sat.	Daily ex. Sunday	Daily	Daily ex. Sunday				Daily ex. Sunday	Daily ex. Sunday	Daily	Daily ex. Sunday
398	351	337	345				344	[illegible]	336	352

SPEED AND GROSS WEIGHT RESTRICTIONS

RESTRICTED SPEED (MPH) AS SHOWN FOR CERTAIN EQUIPMENT

Line	Line Capacity (Lbs.)	Normal Speed	Cars Weighing		Engines in Series		
		Freight	170,000 to 200,000	200,001 210,000	[illegible]	[illegible]	[illegible]
Nashville-Mt. Pleasant	263,000	40					
Mt. Pleasant-Florence	263,000	25					Barred

SIDE TRACKS — NASHVILLE SUB-DIVISION -

Station	Mile	Capacity 55 Ft. Cars
New Wales, Tenn.	262	26
Aspen Hill, Tenn.	273	21
Prospect	278	25
Veto, Tenn.	280	15
Elkmont, Tenn.	286	30
Ashwood, Tenn.	A 239	50
Summertown	A 255	24
Ethridge, Tenn.	A 263	23
Nucarbon	A 273	25
Leoma, Tenn.	A 275	2
Loretto, Tenn.	A 283	30
St. Joseph, Tenn.	A 288	3
Iron City, Tenn.	A 293	12
Jacksonburg, Ala.	A 305	28

YARD LIMITS

Nashville Sub-Division:

Nashville-Radnor
Franklin
Columbia-Natco-Godwin
Siglo-Ashwood-Monsanto
Mt. Pleasant
Lawrenceburg
Florence
Sheffield
Pulaski
Athens Jct.

Bir. 27

POSITION IN FREIGHT OR MIXED TRAIN OF CARS CONTAINING EXPLOSIVES AND DANGEROUS COMMODITIES

No.	1 PLACARD APPLIED ON CAR / 2 TYPE OF CAR		"EXPLOSIVES" ANY CARS	"DANGEROUS" TANK CAR	"DANGEROUS" OTHER THAN TANK CAR	"POISON GAS" TANK CAR	"POISON GAS" OTHER THAN TANK CAR	"FLAMMABLE POISON GAS" TANK CAR	"DANGEROUS RADIO-ACTIVE MATERIAL" ANY CAR
3	RESTRICTIONS								✓ ①
4	WHEN TRAIN LENGTH PERMITS	MUST NOT BE NEARER THAN 16th FROM ENGINE OR OCCUPIED CABOOSE	✓						
5	WHEN TRAIN LENGTH PERMITS	MUST NOT BE NEARER THAN 6th FROM ENGINE, OCCUPIED CABOOSE OR PASSENGER CAR		✓		✓		✓	
6	WHEN TRAIN LENGTH DOES NOT PERMIT	MUST BE NEAR MIDDLE OF TRAIN	✓						
7	WHEN TRAIN LENGTH DOES NOT PERMIT	MUST NOT BE NEARER THAN 2nd FROM ENGINE, OCCUPIED CABOOSE OR PASSENGER CAR		✓		✓		✓	
8	WHEN TRAIN CLASSIFIED	MUST BE NEAR MIDDLE OF BLOCK, BUT NOT NEARER THAN 6th FROM ENGINE OR OCCUPIED CABOOSE	✓						
9	[illegible]	MUST NOT BE NEARER THAN 2nd FROM ENGINE OR OCCUPIED CABOOSE	✓	✓		✓		✓	
10	MUST NOT BE PLACED NEXT TO	ENGINE	✓	✓ ②		✓		✓	
11	MUST NOT BE PLACED NEXT TO	OCCUPIED CABOOSE	✓ ③	✓ ③		✓ ④	✓ ④	✓ ④	
12	MUST NOT BE PLACED NEXT TO	OCCUPIED PASSENGER OR COMBINATION CAR	✓ ③	✓		✓ ④	✓ ④	✓ ④	
13	MUST NOT BE PLACED NEXT TO	OCCUPIED CAR WITH LIVE ANIMALS AND ATTENDANT	✓	✓		✓	✓	✓	
14	MUST NOT BE PLACED NEXT TO — CAR PLACARDED	"EXPLOSIVES"		✓	✓	✓	✓	✓	✓
15	MUST NOT BE PLACED NEXT TO — CAR PLACARDED	"DANGEROUS"	✓			✓	✓	✓	
16	MUST NOT BE PLACED NEXT TO — CAR PLACARDED	"POISON GAS"	✓	✓	✓				
17	MUST NOT BE PLACED NEXT TO — CAR PLACARDED	"FLAMMABLE POISON GAS"	✓	✓	✓				
18	MUST NOT BE PLACED NEXT TO — CAR PLACARDED	"DANGEROUS RADIO-ACTIVE MATERIAL"	✓						
19	MUST NOT BE PLACED NEXT TO	ANY LOADED FLAT CAR EXCEPT THOSE WITH PERMANENT END BULKHEADS; FLATS, PIGGYBACK AND CONTAINER FLATS, TRI-LEVEL AND BI-LEVEL CARS AND ANY OTHER FLAT CAR SPECIALLY EQUIPPED WITH TIE DOWN DEVICES FOR HANDLING VEHICLES ARE CONSIDERED THE SAME AS AN OPEN TOP CAR (SEE LOAD...)	✓ ⑤	✓		✓		✓	
20	MUST NOT BE PLACED NEXT TO	ANY CAR, PIGGYBACK, CONTAINER OR OTHER UNIT HAVING AUTOMATIC REFRIGERATION OR HEATING INTERNAL COMBUSTION ENGINE OPERATING, LIGHTED HEATERS, STOVES OR LANTERNS	✓	✓ ②		✓ ②		✓ ②	
21	MUST NOT BE PLACED NEXT TO	OPEN TOP CAR WHEN LADING PROTRUDES BEYOND CAR ENDS OR WHEN LADING OR CAR ENDS IS LIABLE TO SHIFT	✓	✓		✓		✓	

FOOTNOTES:

① Must not be handled next to carload shipments of undeveloped film.

② Except when train consists only of placarded loaded tank cars.

③ Except when caboose, etc. is occupied by authorized personnel accompanying shipment and it is not equipped with lighted heater, such occupied car must be next behind car placarded "Explosives". If equipped with lighted heater, it must be fourth behind car placarded "Explosives".

④ Except when car is occupied solely by gas handlers or authorized personnel accompanying shipment such occupied car must be next behind placarded car.

⑤ Loaded flat car, except that cars carrying trailers or containers placarded "EXPLOSIVES" as authorized by the regulations in this chapter may be coupled to each other. (Note: Flat cars equipped with permanently attached ends of rigid construction shall be considered as open-top cars.)

LOUISVILLE AND NASHVILLE RAILROAD COMPANY
OFFICE OF THE SUPERINTENDENT
BIRMINGHAM, ALABAMA

July 25, 1977

BULLETIN BOARD ORDER NO. 17 - 74

ALL CONCERNED:

Effective 12:01 A.M., August 1, 1977, change to Rule 93, which becomes effective 12:01 A.M. August 1, 1977, which reads "movements against the current of traffic in yard limits must not be made unless authorized and protected by train order, yardmaster or designated officer". "Designated officer" for obtaining authority to move against the current of traffic between Decatur and South Oakworth will be the dispatcher.

Effective 12:01 A.M., August 1, 1977, when required to provide flag protection under Rule 99, where in territory authorized speed is 35 miles per hour or less, flagman will go back not less than one (1) mile. Where in territory authorized speed is more than 35 miles per hour, flagman will go back not less than one and one-half (1-1/2) miles.

Trains exploding two torpedoes approximately 100 feet apart, or after stopping after exploding one torpedo, will not exceed restricted speed for the above distance after exploding torpedoes.

L. D. Macon
Superintendent

APPENDIX B

LOUISVILLE AND NASHVILLE RAILROAD COMPANY
OFFICE OF THE SUPERINTENDENT
BIRMINGHAM, ALABAMA

July 25, 1978

BULLETIN BOARD ORDER NO. 17 - 166

ALL CONCERNED - BIRMINGHAM DIVISION

At a point other than a terminal where one or more cars are added to a train, and after the train brake system is charged to not less than 65 pounds as indicated by a gauge at the rear of a freight train and on a passenger train to not less than 95 pounds, tests of air brakes must be made to determine that brake pipe leakage does not exceed five [5] pounds per minute as indicated in the brake pipe gauge after a 15 pound brake pipe reduction. After the leakage test is completed, brake pipe reduction must be increased to full service, and it must be known that the brakes on each of these cars and on the rear of the train apply and release. [Note: the L&N standard brake pipe pressure for freight trains is 80 pounds and for passenger trains 110 pounds].

My Bulletin Board Order No. 17-151 dated July 6, 1978 in connection with the above subject is hereby cancelled. The above paragraph will govern.

L. D. Macon
Superintendent

APPENDIX C

Excerpts from Title 49
Code of Federal Regulations
Ch. I - Materials Transportation Bureau

§ 174.91 Position in train of loaded placarded tank car other than car placarded "COMBUSTIBLE".

Except for a tank car placarded "COMBUSTIBLE", a loaded placarded tank car in a moving or standing train may not be nearer than the sixth car from the engine, occupied caboose, or passenger car. However, when the length of the train will not permit a loaded placarded tank car to be so placed, it must be placed as near the middle of the train as possible and not nearer than the second car from the engine, occupied caboose, or passenger car.

[Amdt. 174-26, 41 FR 16082, Apr. 15, 1976, as amended by Amdt. 174-26A, 41 FR 40685, Sept. 20, 1976]

§ 174.93 Position in train of empty placarded tank cars.

In a moving or standing train, empty placarded tank cars, except empty tank cars last containing combustible liquid, may not be placed nearer than the second car from the engine or occupied caboose.

[Amdt. 174-26A, 41 FR 40685, Sept. 20, 1976]

Ch. II - Federal Railroad Administration

§ 217.9 Program of operational tests and inspections; recordkeeping.

(a) Each railroad to which this part applies shall periodically conduct operational tests and inspections to determine the extent of compliance with its code of operating rules, timetables, and timetables special instructions in accordance with a program filed with the Federal Railroad Administrator.

§ 217.11 Program of instruction on operating rules.

(a) To ensure that each railroad employee whose activities are governed by the railroad's operating rules understands those rules, each railroad to which this part applies shall periodically instruct that employee on the meaning and application of the railroad's operating rules in accordance with a program filed with the Federal Railroad Administrator.

§ 218.35 Yard limits.

(a) After August 1, 1977, yard limits must be designated by—

(1) Yard limit signs, and

(2) Timetable, train orders, or special instructions.

(b) After August 1, 1977, each railroad must have in effect an operating rule which complies with the requirements set forth below:

(1) The main tracks within yard limits may be used, clearing the time an approaching designated class train is due to leave the nearest station where time is shown. In case of failure to clear the time of designated class trains, protection must be provided as § 218.37. In yard limits where main tracks are governed by block signal system rules, protection as prescribed by § 218.37 is not required.

(2) Trains and engines, except designated class trains, within yard limits must move prepared to stop within one-half the range of vision but not exceeding 20 m.p.h. unless the main track is known to be clear by block signal indications.

§ 218.37 Flag protection.

(a) After August 1, 1977, each railroad must have in effect an operating rule which complies with the requirements set forth below:

(1) Except as provided in paragraph (a)(2) of this section, flag protection shall be provided—

(iii) When a train stops on main track, flag protection against following trains on the same track must be provided as follows: A crew member with flagman's signals must immediately go back at least the distance prescribed by timetable or other instructions for the territory, place at least two torpedoes on the rail at least 100 feet apart and display one lighted fusee. He may then return one-half of the distance to his train where he must remain until he has stopped the approaching train or is recalled. When recalled, he must leave one lighted fusee and while returning to his train, he must also place single lighted fusees at intervals that do not exceed the burning time of the fusee. When the train departs, a crew member must leave one lighted fusee and until the train resumes speed not less than one-half the maximum authorized speed (including slow order limits) in that territory, he must drop off single lighted fusees at intervals that do not exceed the burning time of the fusee.

APPENDIX C

§ 232.11 Train air brake system tests.

(a) Supervisors are jointly responsible with inspectors, enginemen and trainmen for condition of air brake and air signal equipment on motive power and cars to the extent that it is possible to detect defective equipment by required air tests.

(c) Each train must have the air brakes in effective operating condition, and at no time shall the number and location of operative air brakes be less than permitted by Federal requirements. When piston travel is in excess of 10 inches, the air brakes cannot be considered in effective operating condition.

§ 232.12 Initial terminal road train air-brake tests

(a) Except for run-through and unit run-through trains covered under § 232.19, each train must be inspected and tested as specified in this section at points—

(1) Where the train is originally made up (initial terminal);

(c) Train airbrake system must be charged to required air pressure, angle cocks and cutout cocks must be properly positioned, air hose must be properly coupled and must be in condition for service. An examination must be made for leaks and necessary repairs made to reduce leakage to a minimum. Retaining valves and retaining valve pipes must be inspected and known to be in condition for service. If train is to be operated in electropneumatic brake operation, brake circuit cables must be properly connected.

(d)(1) After the airbrake system on a freight train is charged to within 15 pounds of the setting of the feed valve on the locomotive, but to not less than 90 pounds, as indicated by an accurate gauge at rear end of train, and on a passenger train when charged to not less than 70 pounds, and upon receiving the signal to apply brakes for test, a 15-pound brake pipe service reduction must be made in automatic brake operations, the brake valve lapped, and the number of pounds of brake pipe leakage per minute noted as indicated by brake pipe gauge, after which brake pipe reduction must be increased to full service. Inspection of the train brakes must be made to determine that angle cocks are properly positioned, that the brakes are applied on each car, that piston travel is correct, that brake rigging does not bind or foul, and that all parts of the brake equipment are properly secured. When this inspection has been completed, the release signal must be given and brakes released and each brake inspected to see that all have released.