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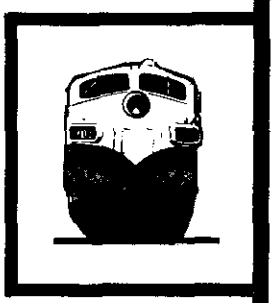

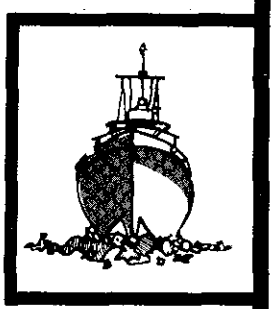

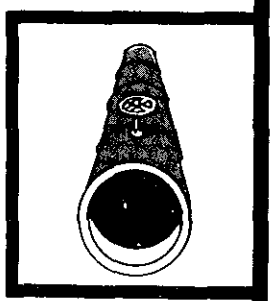

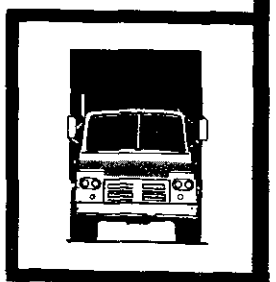

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

DERAILMENT OF ILLINOIS CENTRAL GULF RAILROAD FREIGHT TRAIN EXTRA 9629 EAST (GS-2-28) AND RELEASE OF HAZARDOUS MATERIALS AT LIVINGSTON, LOUISIANA SEPTEMBER 28, 1982

NTSB/RAR-83/05

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

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15. Supplementary Notes

16. Abstract

About 5:12 a.m., c.d.t., on September 28, 1982, Illinois Central Gulf Railroad (ICG) freight train Extra 9629 East (GS-2-28) derailed 43 cars on the single main track of the Hammond District in Livingston, Louisiana. Of the derailed cars, 36 were tank cars; 27 of these cars contained various regulated hazardous or toxic chemical commodities, 2 contained nonregulated hazardous materials, and 5 contained flammable petroleum products. A total of 20 tank cars were punctured or breached in the derailment. Fires broke out in the wreckage, and smoke and toxic gases were released into the atmosphere. Thermally-induced explosions of two tank cars that had not been punctured caused them to rocket violently. About 3,000 persons living within a 5-mile radius of the derailment site were evacuated for as long as 2 weeks. Nineteen residences and other buildings in Livingston were destroyed or severely damaged. More than 200,000 gallons of toxic chemical product were spilled and absorbed into the ground requiring extensive excavation of contaminated soil and its transportation to a distant dump site. This has resulted in long-term closure of the railroad line and an adjacent highway. Property damage has been estimated to be in excess of $14 million.

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Abstract Continued

The National Transportation Safety Board determines that the probable cause of this accident was (1) the disengagement of a worn air hose coupling when the train passed over a low track joint which initiated an emergency application of the train brakes, (2) an excessive buff force within the train resulting from the failure of the person at the locomotive controls to respond properly to the brake application, and (3) the placement of empty cars near the head of the train between heavily loaded cars. Contributing to the cause of the accident were the impairment of the engineer's faculties by alcohol and his abandonment of the locomotive controls to an unauthorized and unqualified person, and the failure of Illinois Central Gulf to supervise train operations and operating personnel adequately, as well as to inspect and to maintain adequately its Hammond District main track. Contributing to the contamination of the environment was tank damage resulting from the lack of shelf couplers on some tank cars and the inadequately protected bottom outlet valves on a number of other tank cars.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

Adopted: August 10, 1983

DERAILMENT OF ILLINOIS CENTRAL GULF RAILROAD FREIGHT TRAIN EXTRA 9629 EAST (GS-2-28) AND RELEASE OF HAZARDOUS MATERIALS AT LIVINGSTON, LOUISIANA SEPTEMBER 28, 1982

SYNOPSIS

About 5:12 a.m., c.d.t., on September 28, 1982, Illinois Central Gulf Railroad (ICG) freight train Extra 9629 East (GS-2-28) derailed 43 cars on the single main track of the Hammond District in Livingston, Louisiana. Of the derailed cars, 36 were tank cars; 27 of these cars contained various regulated hazardous or toxic chemical commodities, 2 contained nonregulated hazardous materials, and 5 contained flammable petroleum products. A total of 20 tank cars were punctured or breached in the derailment. Fires broke out in the wreckage, and smoke and toxic gases were released into the atmosphere. Thermally-induced explosions of two tank cars that had not been punctured caused them to rocket violently. About 3,000 persons living within a 5-mile radius of the derailment site were evacuated for as long as 2 weeks. Nineteen residences and other buildings in Livingston were destroyed or severely damaged. More than 200,000 gallons of toxic chemical product were spilled and absorbed into the ground, requiring extensive excavation of contaminated soil and its transportation to a distant dump site. This has resulted in long-term closure of the railroad line and an adjacent highway. Property damage has been estimated to be in excess of $14 million.

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INVESTIGATION

The Accident

At 4:10 a.m., on September 28, 1982, eastbound Illinois Central Gulf (ICG) freight train Extra 9629 East, consisting of 3 locomotive units, 100 cars, and a caboose, departed

Baton Rouge Junction, Louisiana, for McComb, Mississippi. The engineer, head brakeman, and an off-duty ICG operator-clerk were in the lead locomotive unit. The conductor and rear brakeman were in the caboose. The engineer operated the train until it reached the vicinity of a defective equipment detector at Lockhart, 17.2 miles east of Baton Rouge Junction. At this point, he turned the controls over to the operator-clerk and sat down in one of the seats on the left side of the operator compartment with the head brakeman.

According to the operator-clerk, she was still operating the locomotive when the train reached Livingston, 9.6 miles east of the Lockhart detector. 1/ The locomotive was running in full throttle, and, according to the operator-clerk, the needle of the speed indicator was "bumping 40." Three or four seconds after passing over the crossing of a lane leading to the Livingston Parish School Board Building, she felt the locomotive momentarily rock and dip. The operator-clerk described the event as "bottoming out." She glanced over to the other side of the cab and saw the engineer and head brakeman reclining in their seats in a relaxed position. There was no reaction from the engineer and nothing was said, so the operator-clerk did not change any of the control settings. As the locomotive approached a private crossing located about 1,200 feet east of the School Board crossing, it again "bottomed out." According to the operator-clerk, the train went into emergency braking 2 to 3 seconds later, as evidenced by the Power Control Switch indicator light on the control stand becoming lighted and by the sound of air escaping from the brake stand. She reacted first by placing the automatic brake handle in the emergency position, and then by placing the throttle in "idle" position. According to the operator-clerk, "within a minute" after the emergency brake application, the engineer came over to the controls and placed his hand on her's as she moved the throttle handle. She then pulled the independent brake handle around to the application position, after which the engineer took hold of it. The operator-clerk stated that she did not know what the engineer did with the independent brake handle, although she remained in the operator's seat throughout the stopping sequence and for some time afterward.

During the sequence of events between the time the train went into emergency and the time the forward part of the train came to a stop, there was no noticeable slack action 2/ on the lead locomotive unit. After the head end stopped, the operator-clerk looked to the rear and saw a small fire which suddenly appeared to become a huge fireball. At 5:12:54, the conductor reported seeing an explosion and instructed the engineer by radio to report it to the dispatcher. After making three unsuccessful attempts to contact the ICG's Mays Yard at New Orleans, the engineer radioed the Hammond District dispatcher at 5:14:50 that "The whole world's on fire." (See appendix D.) At first, he was only able to tell the dispatcher that the train was somewhere between Hammond and Baton Rouge. After consulting with the operator-clerk, the engineer informed the dispatcher, "We're at Doyle, Mississippi. Doyle, Miss -. I mean Doyle, Louisiana." 3/ (See appendix D.)

1/ This was corroborated by the engineer and head brakeman in statements given to the Louisiana State Police.

2/ Slack action results when one part of a train moves faster or slower than an adjacent part of the train. After the available slack has either run in or run out, the adjacent parts of the train must rapidly attain uniformity in speed resulting in potentially damaging shock forces. Compressive forward slack action or running in is referred to as buff force; slack running out as draft force. Slack action is greatly affected by a number of factors, including the time interval between the application or release of the brakes at the ends of a train; differences in braking ratio of empty versus loaded cars; length, weight, and makeup of trains; and changes in grade and curvature.

3/ Doyle, a community which is now a part of Livingston, was still carried as a station location in the Hammond District timetable. Livingston was not shown in the timetable.

The 16th through the 58th head cars of Extra 9629 East had derailed along the main track for a distance of about 750 feet at milepost 26.8. (See figure 1.) The maximum distance of lateral divergence of derailed cars from the track was 75 feet to the north and 85 feet to the south. Highway 190, which parallels the railroad to the south, was encroached upon by one of the derailed cars and was completely blocked by a tree that had been toppled by the same car. The 26th through 32nd head cars were tank cars loaded with vinyl chloride, a flammable gas. Two of these cars were breached in the derailment, and gas escaping from the cars quickly ignited creating the fireball which the traincrew had reported seeing. The fireball extended about 400 feet from the south margin of Highway 190, across the derailment site, and through a grove of tall pine trees to a residence located about 250 feet north of the track. An explosion blew in the brick front of the dwelling, and the fireball enveloped the entire structure in flames. The lone occupant escaped by jumping through a window and running to safety. A small storage shed about 100 feet south of the highway also was set afire and numerous fires broke out in the derailment wreckage.

The Livingston fire chief was alerted to the accident by the sounds of derailing cars followed, within what he described as "less than a minute," by a "tremendous explosion." He then saw a fireball through the window of his home. The fire chief arrived at the derailment site between 5:15 and 5:20 a.m., and observed one of his units already responding to the burning shed south of the highway. At the time, he also noticed what appeared to be low-intensity ground fires in the train wreckage. After determining that the residence north of the highway was beyond saving and that occupants of this and nearby dwellings had already fled, the fire chief directed that highway traffic be detoured around the derailment site.

By 5:30 a.m, it was apparent to the fire chief that a pressure fire was developing rapidly in the wreckage. Inasmuch as his units lacked the proper foam equipment needed to fight such a fire, and the train's head brakeman had told him the train contained a car loaded with chlorine, the fire chief and his men began a systematic house-by-house evacuation of Livingston's 1,260 residents. Similar action had also been initiated by the town's mayor after he learned the train contained hazardous commodities. Ultimately, the Louisiana State Police undertook the control and coordination of the response and expanded the evacuation to include an estimated 2,700 persons from within a 5-mile radius of the derailment site.

Injuries to Persons

Injuries	ICG Employees	Highway Travelers	Livingston Residents
Fatal	0	0	0
Nonfatal	0	0	6
None	5	4	1,254*

*Estimate based on 1980 Census.

Train Information

At the time of the accident, Extra 9629 East consisted of 3 locomotive units, 84 loaded cars, 16 empty cars, and a caboose. The train had a trailing weight of 11,022 tons and was slightly more than a mile long. The locomotive was about 200 feet long, weighed 381 tons, and was rated at 8,000 hp. All three locomotive units were General Motors

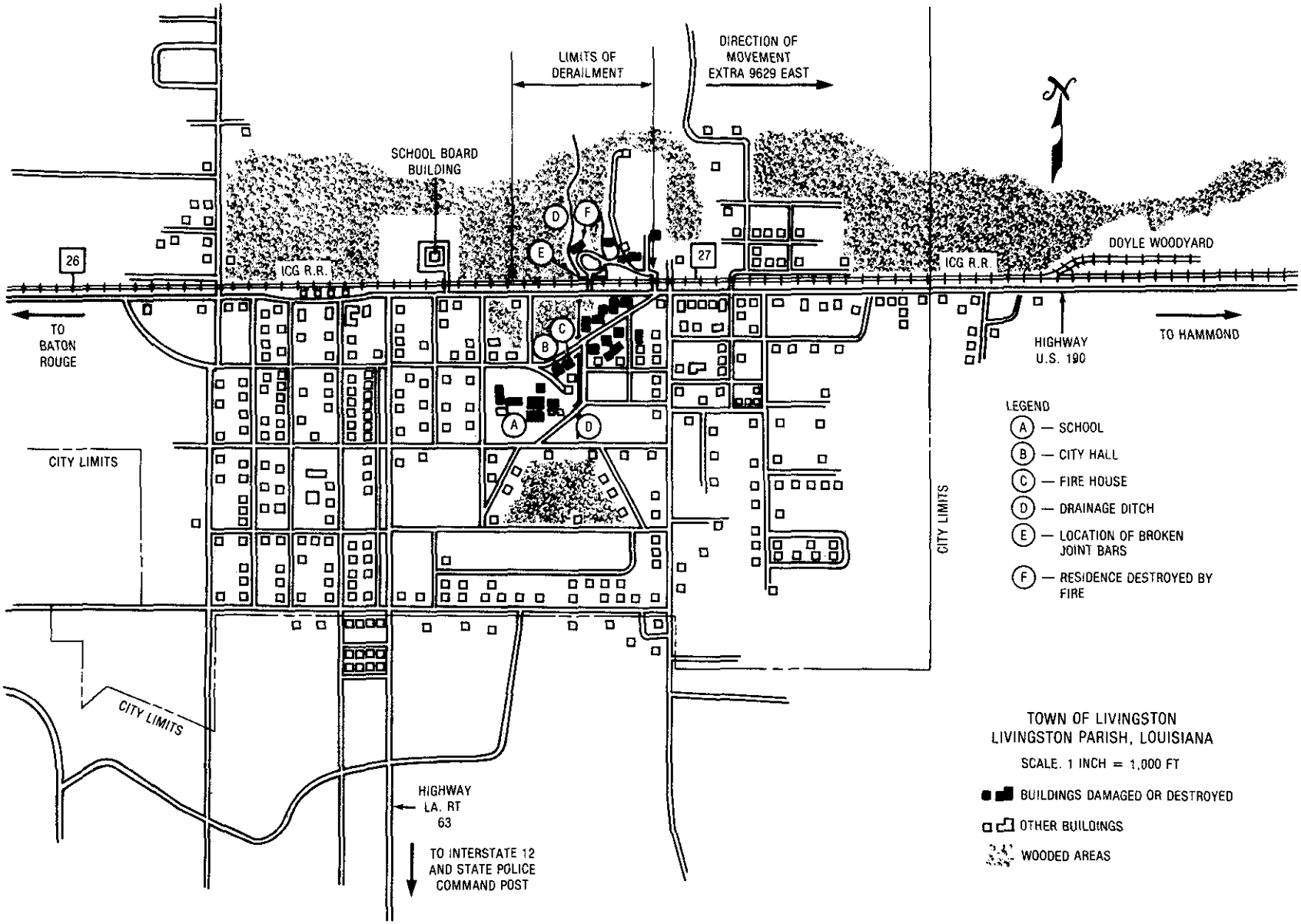

Figure 1.--Map of Livingston, Louisiana, and site of the derailment of Illinois Central Gulf train Extra 9629 East on September 28, 1982.

four-axle type with the lead unit being a model GP38-2 and the trailing units model GP40. The lead locomotive unit had the short, low-profile hood forward and controls on the right, or south side. The unit was equipped with a dual sealed-beam headlight, a radio, a speed indicator, type 26L brake equipment, and an emergency brake valve on the left side of the cab. It was not equipped with a speed recorder, deadman pedal, or crew alerter device. The unit's power control switch (PCS) did not have a time-delay feature. 4/ The locomotive units were inspected and made available for service early in the afternoon of September 27 by a qualified machinist at ICG's Baton Rouge diesel shop. According to the machinist, he inspected the air hoses of all three units and took no exception to them.

Most of the 16 empty cars in Extra 9629 East were scattered throughout the rear half of the train with 4 of them just ahead of the caboose. (See figure 2.) The 5th, 6th, 19th, and 20th cars were the only empty cars in the forward half of the train. These weighed 30 to 35 tons each whereas the 12 loaded cars between the two pairs of empty cars varied in weight from 115 to 131 tons each. Most of the 33 loaded cars behind the 19th and 20th head cars weighed 130 tons or more.

The rear 62 cars and caboose of Extra 9629 East were assembled at the ICG's Geismar, Louisiana yard, and were moved to Baton Rouge as the rear portion of train Extra 8099 North. These cars had been classified, or arranged, in blocks for final ICG destinations. The forward block consisted of long-haul cars destined for Chicago and beyond, while the rear block consisted of short-haul cars to be taken off the train at McComb. Before leaving Geismar, Extra 8099 North was given the required predeparture inspection and brake test by a qualified car foreman and a carman. The forward 38 cars of Extra 9629 East were assembled at North Baton Rouge Yard. They were grouped in two blocks, with the lead 9 cars routed to McComb and the rear 29 cars routed to Fulton, Kentucky, for reclassification. Each of the two blocks contained two empty cars coupled together. The final destination for the two empty cars routed to Fulton was Chicago. The North Baton Rouge cars were inspected and tested by two qualified carmen shortly before Extra 8099 North arrived at 3:45 a.m., on September 28. As at Geismar, the carmen took no exception to the cars at North Baton Rouge Yard, and they were placed ahead of the cars from Geismar by the locomotive and crew of Extra 9629 East. The prescribed leakage test was made, and the conductor observed the brakes properly apply and release at the rear before the train departed.

Before coupling the two portions of the train together, the engineer of Extra 9629 East coupled the locomotive to the north end of the 38-car Baton Rouge fill. The brakepipe air hoses between the trailing locomotive unit (ICG 3022) and the lead car were coupled together by the head brakeman of the crew, which was then taken by the general yardmaster to another part of the yard. After the engineer began shoving the fill toward the draft of cars brought in by Extra 8099 North, the air hoses between the locomotive and first car became uncoupled and caused the brakes to apply in emergency. It was necessary for the engineer to recouple the air hoses before the brakes could be released and movement resumed.

4/ The power control switch acts to idle the diesel engines of the locomotive units when an emergency brake application occurs. Not all major railroad systems have locomotives equipped with the device. Several large systems have adopted a modified PCS which delays power cutoff for approximately 20 seconds after the emergency application occurs. This works to reduce severe buff force in heavy trains resulting from rapid deceleration of the locomotive before all of the train's brakes have applied.

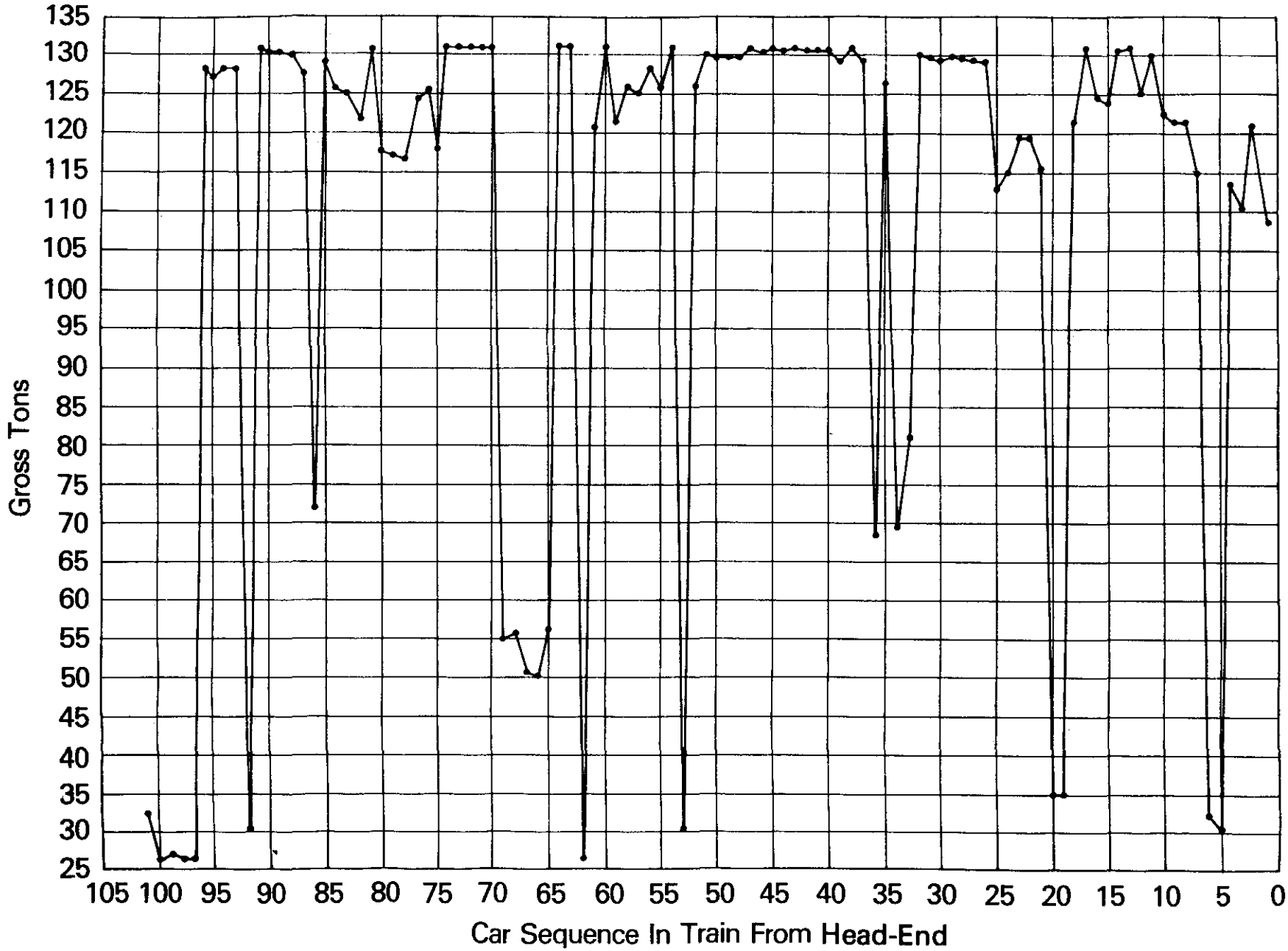

Figure 2.--Tonnage profile for Extra 9629 East.

Shortly after the locomotive and the head 15 cars left Livingston following the accident, the air hoses between the trailing unit and lead car again became uncoupled. Both uncouplings had occurred while the train was moving on the main track.

Tank Car Information.--There were 75 tank cars in the train, 7 of which were empty and 68 of which were loaded. A total of 55 tank cars were placarded as follows:

Placard	Derailed	Not Derailed
Chlorine	0	1
Flammable Gas	8	6
Flammable Liquid	1	6
Flammable Solid	1	0
Poison	4	1
Corrosive	13	14

Of the 36 derailed tank cars, eight had conventional couplers and did not have head shields or insulated tanks; one car had conventional couplers and head shields, but was not insulated; 6 cars had conventional couplers, head shields, and jacketed insulation; and 5 cars had shelf couplers but no head shields or insulation. The remaining 16 cars had shelf couplers, head shields, and insulation. The nine derailed flammable gas and flammable solid cars were among the last group, and of these, five were Department of Transportation (DOT) specification 105A300W and one was a DOT 112J340W. These six cars had jacketed insulation; none was punctured or breached during the derailment. The other three cars were DOT specification 112T340W with coated insulation; the two vinyl chloride cars that were breached in the derailment were among these.

The following describes the performance of the tank cars involved in the derailment:

Protection	Cars with Shell Punctured or Breached	Cars Not Punctured	Total
A) Noninsulated without head shields or shelf couplers	8	0	8
B) Noninsulated with head shields and conventional couplers	1	0	1
C) Jacketed insulation, head shields, conventional couplers	0	6	6
D) Noninsulated with shelf couplers; no head shields	4	1	5
E) Jacketed insulation, head shields, shelf couplers	5	8	13
F) Coated insulation, head shields, shelf couplers	2	1	3
Totals	20	16	36

Only one derailed tank car sustained a coupler-inflicted head puncture which was caused by the car's own coupler being forced upward into the head. This car was a noninsulated DOT 111A100W car without head shields and shelf couplers.

Thirty three derailed tank cars which were loaded actually separated from their trucks; 22 had bottom outlet extensions and, of these, 15 had extensions sheared off or otherwise damaged in the derailment. In eight instances, the valve itself remained closed and no product was lost through the outlet. In seven cases, all or part of the lading was released as a result of damage to the outlet. Eight of the derailed cars had semi-recessed, low-profile outlet valve extensions; one of these also had skids protecting the outlet valve. Another car had a conventional bottom outlet with skid protection. Three of the cars equipped with low-profile outlets were among those which had product released through damaged extensions. One of these was the car that also had skids.

Damage

The forewardmost cars to derail, the 16th through 18th head cars, were 68-foot "jumbo" covered hoppers loaded with plastic pellets. These came to rest north of and in line with the track, with the 16th car completely overturned and the others on their north sides. (See figure 3.) The trucks of the 18th car had forced the north rail out of alignment, causing the three cars to tip over and fall from the track structure. There was very little forward movement of these cars after they turned over. The cars were not substantially damaged, and most of their contents was salvaged.

The 19th and 20th head cars were empty 57-foot, high-side gondolas used to transport coil steel. Both were detached from their trucks but remained upright. The lead gondola was struck in the northwest corner by the lead end of the trailing gondola and jackknifed horizontally to the south about 135° counterclockwise. It stopped on a southeast-northwest axis with the head end still on the track alignment partially propped up on the car's forward truck. After jackknifing vertically, the trailing gondola (EJ&E 4712) had also jackknifed horizontally to the south and had moved about 140° clockwise before coming to a stop on a southwest-northeast axis. What had been the lead end came to rest on the shoulder of Highway 190. This end had a vertical crease the full height of the car where it had struck the corner of the gondola ahead of it. (See figure 4.) The car had also taken a heavy strike in what had been the south side.

The 21st through the 23d cars, tank cars loaded with petroleum products, had also jackknifed horizontally to the south, with the 21st car coming to a stop between the two gondola cars. All three cars were separated from their trucks and heavily damaged. The 23d car was breached and lost much of its cargo of lubricating oil.

The 24th through 38th head cars were separated from their trucks and came to rest perpendicular to the track alignment. These cars were tightly bunched together, more or less side by side. This group consisted of 13 loaded tank cars, including seven vinyl chloride cars, and two "jumbo" covered hoppers loaded with plastic pellets. All were damaged beyond economical repair, and the contents of all but four cars were lost.

The 39th through 56th cars were tank cars, all but one of which were loaded with chemical products. These cars stopped in various attitudes, with most of them stopped diagonally to the track alignment. All were heavily damaged, and, except for the 56th car, all the loaded cars were punctured or breached and lost all or most of their contents. The 57th and 58th cars were chemical-laden tank cars which remained coupled together and in line with the track. They sustained only minor damage and did not lose any of the product they contained.

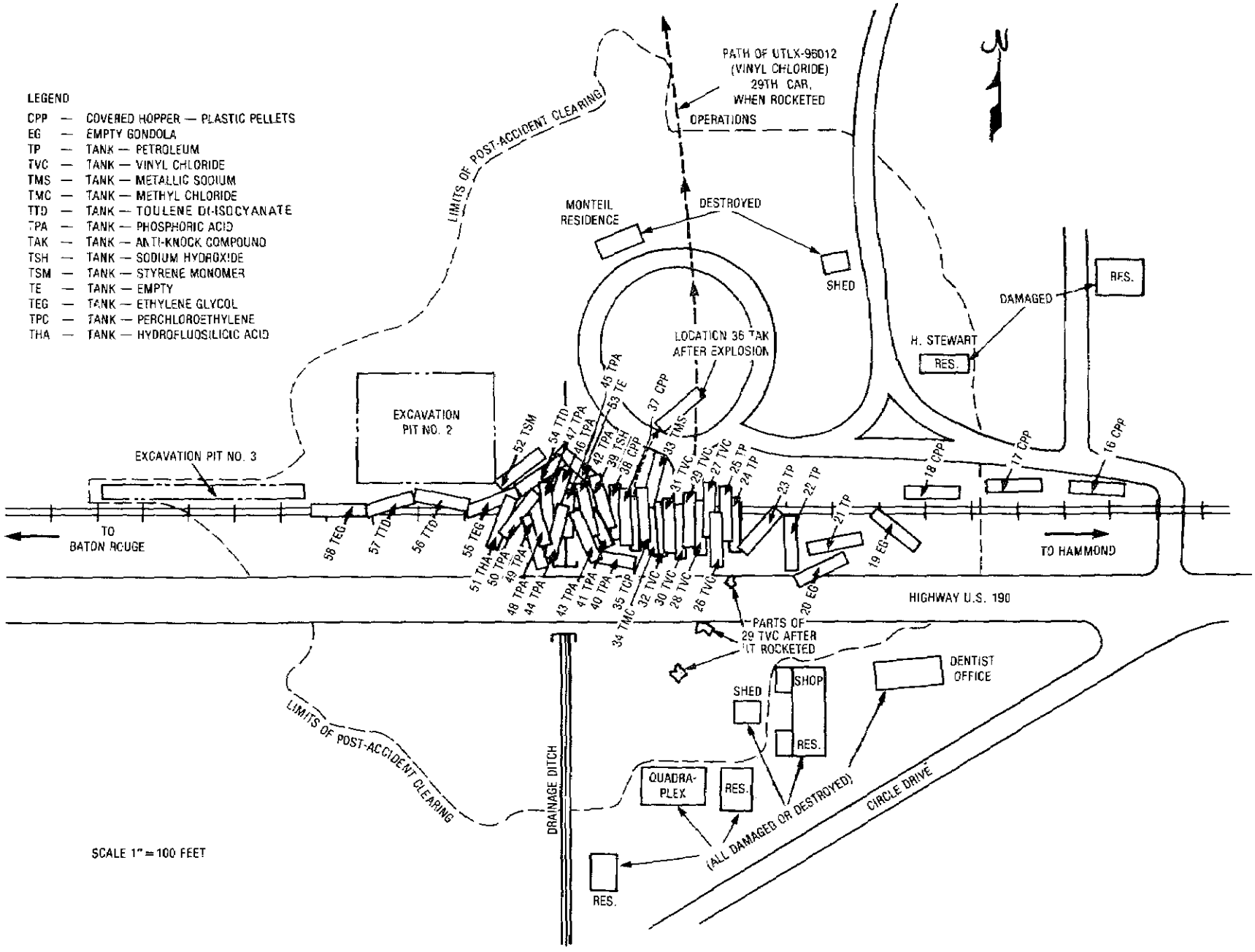

Figure 3.--Derailment site and wreckage distribution.

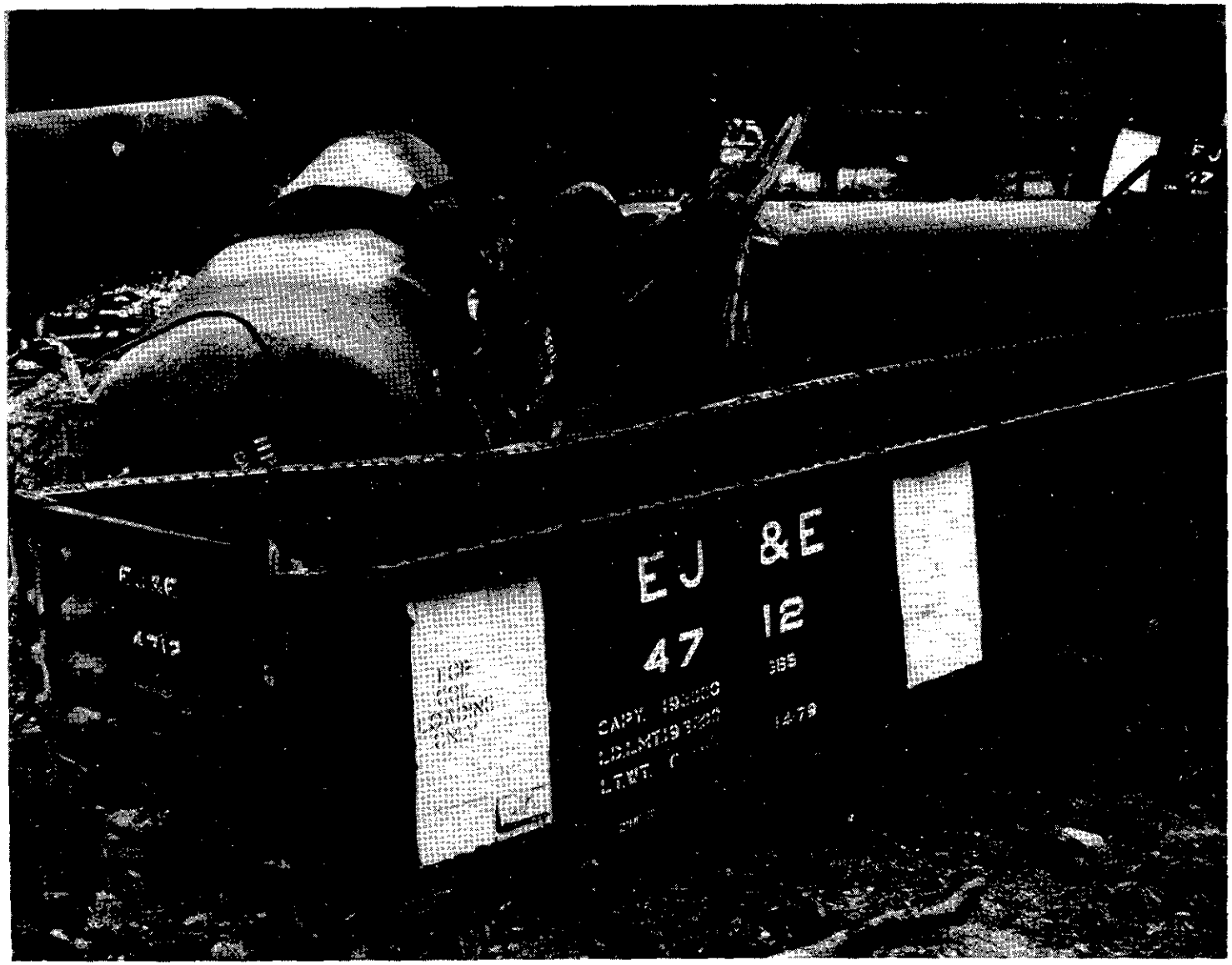

Figure 4.--Lead end of gondola car EJ&E 4712 showing strike damage to end and side. The tank car standing alongside was immediately behind the gondola car in the train.

A fireball ignited oil leaking from the 22d and 23d cars, and plastic pellets spilled from the 37th and 38th cars. Vinyl chloride gas venting from the 30th and 31st cars burned, as well as styrene monomer and toluene diisocyanate leaking from the 52d and 54th cars, respectively. These fires produced large clouds of black, acrid smoke which often obscured much of the derailment site. (See figure 5.) The fires fed by plastic pellets and vinyl chloride grew progressively larger and hotter and impinged on the cars adjoining them. As a result, the 27th, 28th, and 32d cars, all vinyl chloride cars, began to vent and burn at the domes. The pellet fire became so intense that the 36th car, loaded with motor fuel anti-knock compound (tetra-Ethyl lead), exploded about 19 hours after the derailment. The shell of the car was propelled into the pine grove north of the derailment and the south tank head landed south of Highway 190. A second thermally-induced explosion occurred on October 1, 82 hours following the derailment. This involved the 29th car, which was loaded with vinyl chloride. In this instance, the south tank head was propelled about 225 feet south and struck an unoccupied quadraplex dwelling. Most of the tub portion of the tank rocketed approximately 425 feet north through the pine grove. Large sections of the steel outer insulating jacket came to rest on both sides of Highway 190. (See figure 6.) Airborne fragments are believed to have set fire to a 55-foot mobile home and an adjoining outbuilding about 500 feet south of the derailment site. Other parts traveled as far as 1,500 feet south.

Concern over the stability of the burning styrene monomer car prompted emergency forces to extinguish the fire on October 4, and then to demolish the car with explosive charges the next day. The six remaining vinyl chloride cars were detonated on October 11, to dispose of the unvented product still remaining in them. In all, 36 cars were destroyed either by crushing impacts during the derailment or by postaccident fires, explosions, and demolition. About 600 feet of track were destroyed.

The contents of 30 cars were either totally or partially lost. Tank car chemical products lost were approximated as follows:

Commodity	Gallons	Pounds
Vinyl chloride	163,043	1,241,000
Styrene monomer	23,145	176,000
Motor fuel anti-knock compound	5,666	75,000
Toluene diisocyanate	2,259	23,000
Phosphoric acid	148,552	2,100,000
Hydrofluosilicic acid	19,780	200,000
Sodium hydroxide	15,363	195,000
Perchloroethylene	14,028	190,000
Ethylene glycol	20,840	194,000

The first four commodities listed were consumed by fire, the remainder were spilled and absorbed in the ground environment, including about 183,000 gallons of the corrosives phosphoric acid, hydrofluosilic acid, and sodium hydroxide. Ethylene glycol and perchloroethylene are not DOT regulated commodities and were not classed as hazardous substances or materials. In the early response to the derailment, the perchloroethylene spillage was not considered to be a problem. However, it was later learned that the chemical can be highly toxic, even in minute concentrations.

Much of the chemical product released was recovered from catch basins and diked drainage ditches. More than 100 truckloads of recovered and neutralized chemicals were transported to designated dump sites. However, the Louisiana Department of

Figure 5.--Aerial view of the derailment site, about midday on September 28, viewed facing north. The intense fires in the center of the photo are burning plastic pellets. The seven vinyl chloride cars are to the left of the large tree in the extreme right side of the photo.

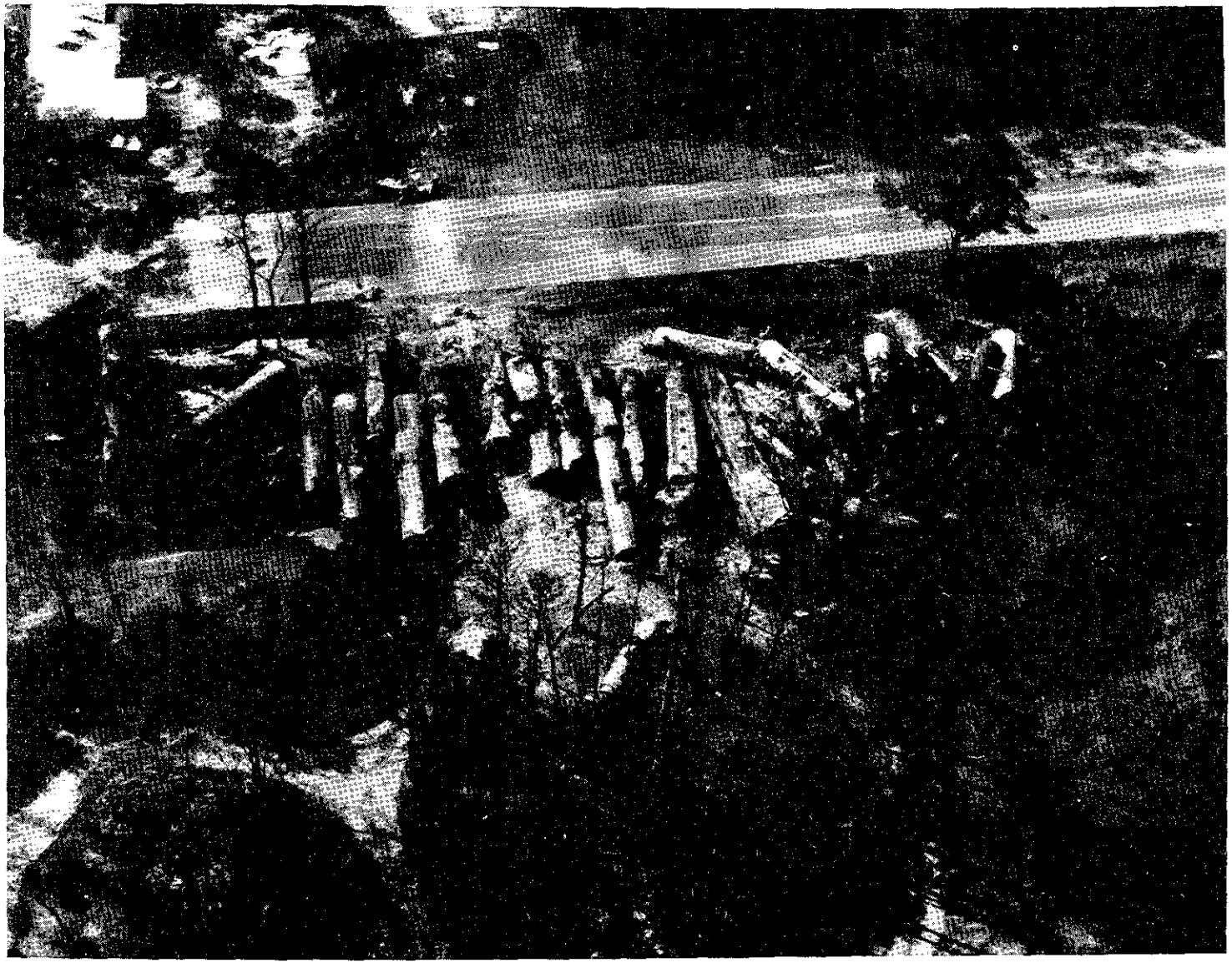

Figure 6.--The derailment site on October 4, 1982, viewed facing south. Parts of the vinyl chloride tank car which rocketed are on and just south of the highway. Buildings that were destroyed or severely damaged are shown in the upper left corner.

Natural Resources directed the excavation of more than 60,000 cubic yards of soil from the derailment site that were determined to be toxically contaminated by perchloroethylene. The soil has been trucked to a dump site about 150 miles from Livingston. The work is still in progress, and excavating is being done to a depth of 22 feet over an area of several acres on both sides of Highway 190. (For further discussion on perchloroethylene, see p. 28.) The railroad has not been rebuilt through the derailment site, and through service over the Hammond District has not been restored.

A dwelling, a mobile home, three outbuildings and about 5 acres of loblolly pine trees were destroyed by fire. Two residences northeast of the derailment site and 20 residential and commercial buildings south of Highway 190 sustained blast damage. These included Livingston's high school, courthouse, and firehouse. There was extensive fire scorching of trees, ornamental plants, and lawns within a 1,000-foot radius of the derailment site.

Damage was estimated as follows:

Train Equipment	$ 1,500,000
Train Lading	1,013,000
Track	70,000
Salvage and Wrecking	32,000
Miscellaneous*	11,949,000
Total	$14,564,000

*According to ICG, this includes reimbursement of evacuation costs, personal injury and property damage claim payments, as well as expenses incurred in air, soil, and water treatment, and the excavation and shipment of contaminated soil as of April 7, 1983.

Crewmember Information

The crew of Extra 9629 consisted of a conductor, an engineer, and two brakemen. All were qualified under ICG operating rules without restrictions. (See appendix B.) The conductor and brakemen were regularly assigned to train GS-2 and its westbound counterpart, MG-5, operating between McComb, Mississippi, and Baton Rouge, Louisiana. The engineer was assigned to the extra list 5/ and was filling a temporary vacancy on the crew. McComb was the home terminal for all the crewmembers.

At the time of the accident, the crew had been on continuous duty for 1 hour 42 minutes and on "aggregated" or interrupted duty for a total of 5 hours 22 minutes. 6/ They had originally reported for duty at McComb at 7:00 p.m., on September 27, and arrived with train MG-5-27 at Baton Rouge at 10:10 p.m. The crew

5/ The extra list, or extra board, consists of engineers not regularly assigned who are used to man extra trains, or to fill temporary vacancies in regular crews.

6/ Federal regulations (49 CFR Part 228) permit broken or interrupted on-duty service by train and engine service employees aggregating a total of 12 hours providing the employee(s) are given an interim rest period at a designated terminal of not less than 4 hours. The total of the duty periods before and after the rest period may not exceed 12 hours. Baton Rouge was a designated ICG terminal as provided for in the law, and it was a common practice to have McComb-based crews placed on interim rest there between runs.

went off duty at 10:40 p.m., and after an interim rest period of 4 hours 50 minutes, they went back on duty at 3:30 a.m., when they were called for Extra 9629 East (GS-2-28). Prior to reporting for duty at McComb, the engineer had been off duty for 24 hours; the other crewmembers for 36 hours.

During their interim rest period at Baton Rouge, the crewmembers were provided with individual rooms at the Prince Murat Motor Inn. They were transported there by the motel's van and registered for the rooms at 10:47 p.m. The conductor and rear brakeman stated that they went directly to their rooms and slept until called by the ICG operator-caller on duty at North Baton Rouge Yard about 2:30 a.m. About 11:30 p.m., the engineer and head brakeman went into the lounge of the Prince Murat. The waitress and bartender in the lounge identified the men as having been served two mixed liquor drinks apiece, one of which they consumed in the lounge and the other they carried out in plastic drinking glasses. The bartender recalled that the second drink served to each of the men was a "double." Both the engineer and head brakeman stated they had one drink in the lounge and were served another to carry out.

About 11:00 p.m., before going to the lounge, the head brakeman telephoned an off-duty ICG operator-clerk, a close friend of the engineer, and suggested that she visit them at the motel. She agreed and drove the approximately 15 miles from her home to the motel. Arriving shortly after midnight, she found the brakeman and engineer in the brakeman's room and noticed two plastic drinking glasses containing "melted ice" on a night stand. The operator-clerk agreed to take the men out to find something to drink, after they assured her that they had been told they would not be called to return to duty before 6 a.m. They found an open convenience store about a mile from the motel where the engineer bought a fifth of 86-proof Bourbon liquor and a 2-liter bottle of soft drink. After returning to the brakeman's room, the men began drinking liquor mixed with the soft drink. Having learned from the operator-caller at North Baton Rouge Yard that they were to go back on duty at 3:30 a.m., the men asked the operator-clerk to drive them to the ICG roundhouse and to ride with them to McComb. She agreed to do this after ascertaining that she was not going to be called in to work on the morning shift. The operator-clerk stated that they left the motel about 3:10 a.m. and drove directly to the roundhouse with the brakeman carrying the liquor bottle in his grip. 7/ The conductor and rear brakeman were taken to the North Baton Rouge yard office by the motel courtesy van. They had no direct contact with the engineer and head brakeman until sometime after they had gone back on duty.

The operator-clerk testified that after parking her car at the roundhouse, she and the engineer and brakeman went directly to the locomotive and boarded it. They encountered only a roundhouse laborer who was in the locomotive's cab and who later stated that he observed her enter the cab. He also stated that the brakeman cautioned him not to say anything about it to the brakeman's brother-in-law, who was employed at the roundhouse. Before leaving Baton Rouge, the engineer bought a pack of cigarettes from the general yardmaster at the yard office. Shortly afterward, the yardmaster transported the conductor and both brakemen in his pickup truck to the south end of the yard. The engineer also conversed by radio with the engineer of another train before leaving Baton Rouge. According to the operator-clerk, by this time the engineer was having trouble talking. "He wasn't talking right. I was concerned that he drank too much. He was slurring his speech." She said that the head brakeman told him, "For God's sake, Peyton, stay off the radio."

7/ The purchase of the liquor and taking the bottle on the train was corroborated by both the engineer and head brakeman. According to the engineer, he continued to drink from his glass while en route from the motel to the roundhouse.

In her sworn testimony, the operator-clerk stated that the two men drank half the bottle of liquor, with the engineer drinking more than the brakeman, while they were still at the motel. 8/ The operator-clerk recalled that the brakeman had only one drink from the liquor bottle after the crew went back on duty. However, she stated that the engineer resumed drinking after Extra 9629 East left Baton Rouge and continued to do so until the derailment occurred. She stated that following the accident, the engineer attempted to dispose of his plastic glass by throwing it out a window of the locomotive cab. The window was closed, however, and the contents of the glass were splashed inside the cab and on the jacket the engineer was wearing. According to the operator-clerk, "about 2-1/2 to 3 inches" of liquor remained in the bottle at the time. After the locomotive stopped, the brakeman threw the bottle into the brush adjacent to the track. As far as the Safety Board could determine, the bottle was not recovered after the accident.

According to the operator-clerk, the head brakeman was "pretty well put together" after the accident occurred, but described the engineer at this time as "very upset," "disjointed," and "fairly incoherent." She testified that he had difficulty repeating the 5-word, radio-transmitted train order about 40 minutes after the accident, although she wrote it down as it was transmitted and coached him as he repeated it. Later, the dispatcher instructed the engineer to leave the locomotive and to flag down traffic on the adjacent highway, and the engineer replied that he would do so. However, the operator-clerk testified that she got fusees from the middle locomotive unit and flagged the highway herself in order that the engineer could stay out of sight, on the locomotive.

The operator-clerk stated that the engineer and head brakeman both chewed tobacco in an effort to mask the smell of liquor. She described the smell of alcohol in the locomotive cab as "overpowering," and she said they lit a fusee in an effort to expunge the odor. About 7:00 a.m., shortly before the operator-clerk was picked up by a friend, 9/ she saw the engineer talking to the senior division trainmaster near the locomotive. She was worried that, "If anyone got within ten feet of him, they would fire him, put him in jail." She described him as befuddled and quite inebriated. "He was visibly having problems. His eyes were red and watery. He was disheveled. He smelled like alcohol." By this time, the operator-clerk was wearing the engineer's jacket which both she and her friend said reeked of alcohol. According to the operator-clerk, she did not see the trainmaster or anyone else board the locomotive before she left the scene of the accident.

About 8:00 a.m., the locomotive and head 15 cars of the train left Livingston with the full crew and proceeded to McComb. The crewmembers were reportedly interviewed by a trainmaster and the division transportation superintendent at Hammond, but were

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8/ In his statement to the State Police, the engineer estimated that he and the head brakeman drank about one-third of the bottle at the motel and he recalled that he drank the equivalent of "about 2 bar drinks" on the train. The engineer also confirmed the operator-clerk's statement that she refrained from drinking liquor at the motel and afterward. Both the engineer and head brakeman admitted that the operator-clerk was operating the train when the derailment occurred. According to the head brakeman, he had nothing to drink from the bottle, but he admitted throwing the bottle off the locomotive after the derailment occurred.

9/ Following the accident, the operator-clerk had the head brakeman telephone a friend, who was also her sponsor in an alcohol rehabilitation program, and ask her to come to Livingston to pick her up. The friend responded and drove the operator-clerk back to Baton Rouge. During the trip, the operator-clerk related what had occurred before and after the derailment. The friend later corroborated the operator-clerk's recollection of the conversation, as well as much of her testimony given to the Safety Board.

never subjected to a breathalyzer test or a toxicological examination. On October 14, 1982, the engineer, head brakeman, and the operator-clerk were arrested by Louisiana State Police and charged with violation of a Louisiana statute prohibiting the negligent transportation of hazardous materials. All were subpoenaed to testify at the Safety Board's public hearing into the accident conducted on November 15-17, 1982, but all declined to testify at that time on the grounds of possible selfincrimination. However, the operator-clerk voluntarily gave her sworn testimony to the Safety Board on December 9, 1982. (See appendix A.) To date, the engineer and head brakeman have not given a statement to the Safety Board, although they have given formal statements to the State Police. In June 1983, the engineer was indicted in Livingston Parish for negligent transportation of hazardous materials, with the head brakeman and the operator-clerk agreeing to testify on behalf of the State.

The conductor, engineer, rear brakeman, and head brakeman had been employed by Illinois Central Gulf and its predecessor, Illinois Central, since 1941, 1969, 1963, and 1969, respectively. All were qualified without restriction except for the conductor and head brakeman, who were required to wear eyeglasses while on duty. The conductor was promoted from brakeman in 1953, and the engineer had changed status from brakeman to fireman in 1972. He was promoted to engineer in 1973 after completing an accelerated engineer training program in less than 6 months. The operator-clerk had held various operating department clerical assignments since being hired by ICG in 1979. She testified that she had worked from time to time as a yardmaster at ICG's Geismar, Louisiana Yard.

All of the crewmembers of Extra 9629 East and the operator-clerk were discharged by ICG following the Livingston accident. With the exception of the rear brakeman, all had been previously discharged for rule violations and were subsequently rehired on a leniency basis on at least one occasion. The conductor had been discharged as an unsafe employee in 1968 on the basis of his having been injured on-duty 20 times. During 1978, he was formally reprimanded for a violation of a hazardous materials handling rule and for a violation of a speed restriction. The engineer had been arrested and jailed for criminal mischief and disturbing the peace in a tavern while subject to duty in 1974. As a result, ICG discharged him for violations of rules prohibiting the use of intoxicants, breaking the law, and being absent from duty. The engineer was also discharged in 1979 for repeatedly failing to report for work. From 1973 to the time of the Livingston derailment, the engineer was also reprimanded five times and suspended six times, for a total of 143 days, for various rules violations, including running at excessive speed, failure to comply with stop signals, allowing an unauthorized and unqualified person to operate his locomotive, running through a switch, failure to properly inspect his locomotive, failure to respond to flag and hand signals resulting in collisions, and for repeatedly failing to report for work.

The head brakeman had been discharged twice, in 1974 for violation of the ICG's rule prohibiting the use of drugs, and in 1975 for having been convicted of three counts of selling drugs to undercover agents. The 18-year penitentiary sentence he received was suspended in lieu of probation and he was rehired by ICG in 1976. In 1977, the head brakeman was suspended for 5 days for failing to report knowledge of an injury to another employee. The rear brakeman had been reprimanded four times for minor rules infractions, but had never been suspended or discharged. For about 10 years prior to the Livingston derailment, he had worked on an irregular basis, frequently laying off and being granted extended leaves of absence. The operator-clerk had been discharged in February 1982 for unauthorized absence from duty, but she was reinstated by ICG 5 months later.

Track Information

ICG's Hammond District is a single track secondary line which traverses a flat, low-lying area. At the accident location, the gradient was virtually level 10/ and the elevation above sea level was 47 feet. Between the Baton Rouge yard limit at milepost 8.7 and Hammond, there is only one curve, which is 1° in curvature. The curve is located about 3 1/2 miles west of the accident location.

The Hammond District track was maintained to meet or exceed Federal Railroad Administration (FRA) track safety standards for Class 3 track. 11/ The entire line was laid with 112- or 115-pound RE section 12/ continuous welded rail (CWR) except for about 1.4 miles between mileposts 26.4 and 27.8 at Livingston. This section, which includes the derailment site, was laid with 115-pound jointed 39-foot rails rolled in 1950 and 1951 and relaid in 1972. The rails were joined with 36-inch, 6-hole joint bars fully bolted, and rested on double-shouldered 10 7/8 x 7 5/16-inch tie plates with some single-shouldered 10 3/8 x 7 1/2-inch plates intermingled. The treated 8- and 8 1/2-foot crossties were nominally laid on 19-inch centers with the rails fastened by two rail-holding spikes per tie plate. Every third tie had been box-anchored to prevent longitudinal rail movement. Numerous anchors were missing, but no appreciable rail movement was evident. Ballast consisted of a mixture of crushed stone, crushed slag, and gravel of varying depth which was contaminated in places by mud.

Ties were last renewed in the jointed rail section in April 1976 at the rate of about 800 ties per mile. At that time, the track was also surfaced and aligned with sufficient ballast added to fill the tie cribs. Prior to the derailment, ICG had last tested the rails in the jointed-rail section for internal defects in June 1982. The testing revealed a 5-inch bolt hole break in a rail at milepost 27.8. The defective rail was replaced at the time of the inspection. A FRA track geometry car was operated over the Hammond District on March 27, 1981, and detected a wide gauge condition just west of the derailment site. Although the gauge condition was well within FRA's allowable limits for Class 3 track, it had been corrected. Postaccident measurements over distances of 858 feet west and 507 feet east of the derailment site indicated a maximum gauge one-half inch wider than standard gauge, whereas the Federal track standards allow 1.75-inch wide gauge in Class 3 track.

The Hammond District was inspected for Federal track standards compliance by a Louisiana Department of Transportation track inspector on May 24, 1982. 13/ The inspector found three center-cracked joint bars in the jointed section at Livingston at mileposts 26.4, 26.7, and 27.3. The defective bars were replaced in June 1982. During the wreckage-clearing operations, a piece of rail was found in the 37th head car at the culvert at milepost 26.8. The two joint bars, transversely center-fractured at the rail ends, were still bolted to what was established as having been the west end of the rail. The rail head was battered 1 inch vertically and 1 1/4 inches horizontally along the top of the rail. Subsequently, the adjoining west rail was found with the matching halves of the joint bars

10/ Between mileposts 26.1 and 26.8, the gradient was 0.05 percent ascending eastbound, a rise in vertical elevation of about 2 1/2 feet per mile. The grade was level for about .9 mile west of milepost 26.1 and for about .3 mile east of milepost 26.8.
11/ 49 CFR Part 213.9, "Classes of Track," prescribes maximum allowable operating speeds of 60 mph for passenger trains and 40 mph for freight trains over Class 3 track.
12/ Rail nominally weighing 112 or 115 pounds to the linear yard and of a standard type recommended for use by the American Railway Engineering Association.
13/ Louisiana participates in the investigation and surveillance activities concerning Federal railroad safety laws, as provided for in 49 CFR 212.103.

still bolted to what had been the east end of the rail. This rail head was battered to a depth of one-fourth inch vertically and five-eighths inch horizontally. In both cases, the pattern of damage was relatively uniform across the ball of the rail. Neither rail had flange marks or other evidence to indicate derailment might have occurred at this location.

Vertically-pumping joint conditions were found at mileposts 26.45, 26.66, 26.96, 26.99, and 27.1. All but the first of these were near grade crossings. None of the pumping joints were beyond the limits of the track standards, but the bars in the joint at milepost 27.1 fractured on a transverse plane under a work train following the accident. The fractures were similar to those in the bars found in the wreckage at milepost 26.8. (See figure 7.)

Following the accident, the Safety Board learned that the track at milepost 26.8 had been on a fill across a cast-iron or steel culvert at about the point where the rail with the broken joint bars was found. The culvert carried a drainage ditch under the railroad. This ditch, or gully, had originally been crossed by a pile trestle. According to a resident of one of the houses north of the derailment site, the culvert had been installed and the trestle filled many years ago. The trestle had been left in place. According to the resident, the culvert location had been the site of a chronic pumping joint condition prior to the accident.

An ICG track inspector had last inspected the track through Livingston on September 21 and 23, 1982. The section foreman and two trackmen had also inspected the track on September 24 and 27. Both the track inspector and the section foreman were designated by ICG as qualified under Federal track regulations. Neither man noted any track irregularities between mileposts 26 and 27. Both stated that they were unaware that there was a culvert under the track at milepost 26.8, and no record could be found to indicate when a culvert inspection was last performed at this location.

Method of Operation

The accident occurred on the ICG's Hammond District which extends 43.7 miles east and west between Baton Rouge and Hammond, Louisiana. Trains are operated over the single main track by timetable and train orders. There are no wayside block signals. Before the accident, two through freight trains were operated daily in each direction between Baton Rouge, Hammond, and McComb, Mississippi, a distance of 94 miles. In addition to the Hammond District, these trains used the double-track McComb District main track between Hammond and McComb. Before a train can pass from the one district to the other at Hammond, the train must be stopped and a member of the crew must operate a switch by hand. Similarly, after the train has cleared the switch, it must again be stopped so that the switch can be realigned for mainline movement.

Trains leaving Baton Rouge at night are furnished clearance and train orders for movement through to McComb, since there is no operator on duty at Hammond at that time. Train orders and messages are routinely transmitted by radio to the crews of trains en route. ICG rules require that a member of the crew copy and properly repeat radio train orders before they can be shown complete. The dispatcher for the Hammond District is located at Chicago, Illinois, and he communicates with crewmembers and operators through a microwave radio system. These communications are taped. The larger radios on ICG's locomotives and cabooses usually transmit a signal strong enough to be picked up and taped by the microwave system; the small walkie-talkie radios issued to

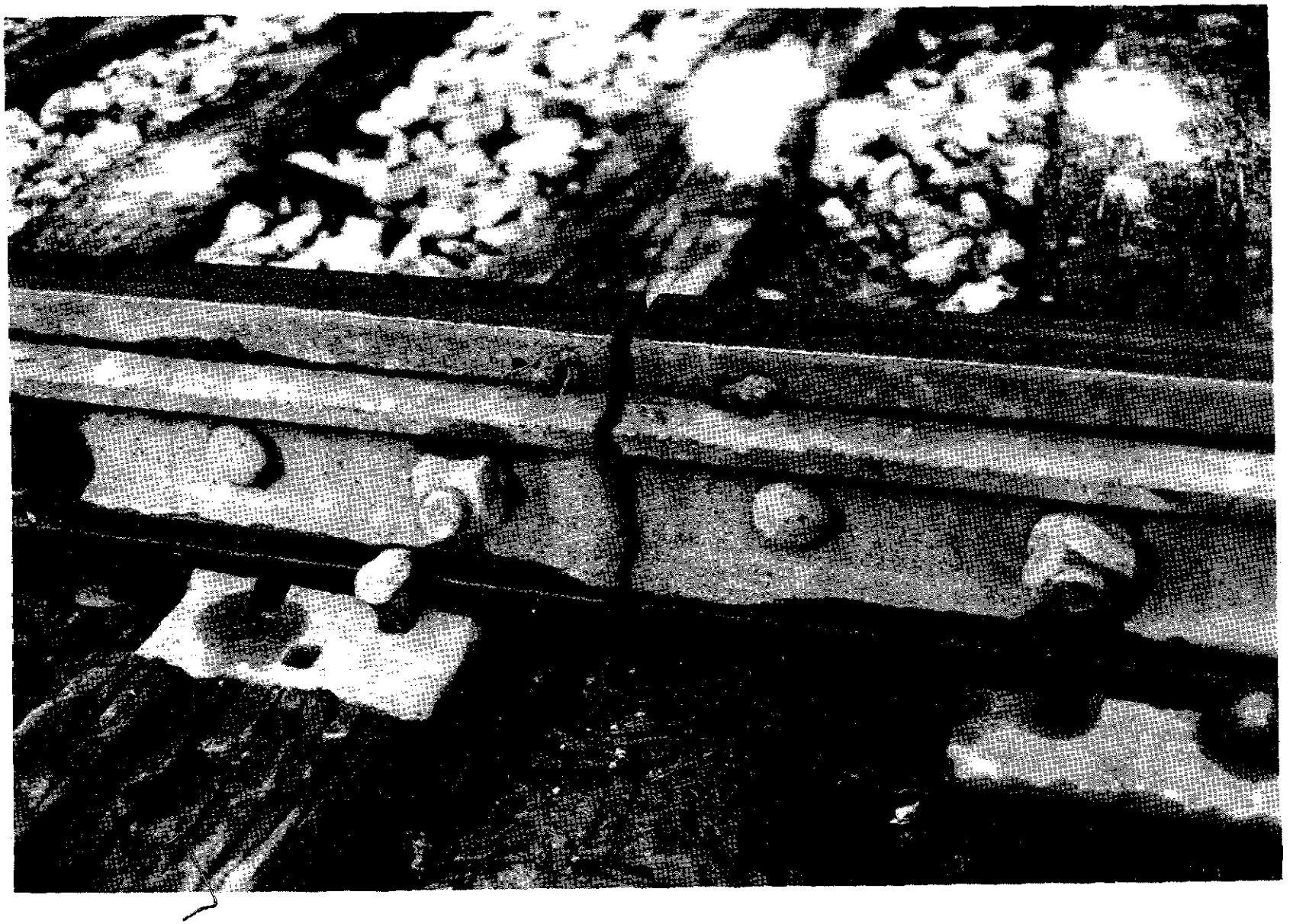

Figure 7.--Joint bar with center transverse fracture located at a pumping joint near milepost 27.1. This failure occurred after the Livingston derailment and was similar to the joint-bar failure at the culvert (milepost 26.8)

the crews usually do not. A hotbox and dragging equipment detector is located at milepost 17.16, near Lockhart on the Hammond District. This is not equipped with a wayside indicator, but the dispatcher is required to inspect the machine's readout tape, and to contact the traincrew if the tape indicates the train has an overheated journal or dragging equipment. If no defect is indicated, the crew is not contacted and they continue on the assumption that there is no problem with their train. The detector tape for Extra 9629 East did not indicate a defect in the train, and there was no communication between the dispatcher and the traincrew.

Maximum speed for freight trains on the Hammond District is 40 mph. However, there are only two sections totalling 9.1 miles in length where this speed is actually permitted by the timetable. Between milepost 0.0 at Baton Rouge Junction and milepost 4.9, speed is restricted to 10 mph, and beyond that point to the yard limit at milepost 8.7, speed is restricted by ICG Rule 93 to that which would permit stopping within one-half the range of vision up to a maximum of 20 mph. (See appendix C.) East of milepost 8.7, speed is restricted to 25 mph to milepost 21.1; 40 mph between mileposts 21.1 and 25.7; and 35 mph between mileposts 25.7 and 27.5, where the accident occurred. At the time of the accident, the timetable and a general order further restricted speed to 10 mph over three highway grade crossings between mileposts 4.9 and 8.7.

ICG operating Rule G prohibits the possession and use of intoxicants and narcotics by employees while on duty, as well as their use by employees subject to duty. (See appendix C.) There are also ICG rules that prohibit engineers from allowing unauthorized persons to operate or ride on their locomotives. (See appendix C.) ICG Rule 99 requires that when a train is stopped and may be overtaken by another train, a member of the train's crew must provide flag protection, including placing torpedoes and burning fusees at specified distances from the rear end of the train. Extra 9629 East had been given a train order relieving the crew of this responsibility, as is customary on the Hammond District. However, about 35 minutes after the accident, the operator-caller at North Baton Rouge Yard transmitted a one-sentence, five-word train order to the engineer which annulled the relieving order. (See appendix D.) This, in effect, required that the crew comply with Rule 99. The order was inaccurately repeated by the engineer, and he did not advise the conductor or rear brakeman of its contents. During the investigation, the Safety Board determined that the crew did not comply with the rule.

ICG's Air Brake and Train Handling Rules state, (1) "Probably no element of braking can create shock conditions more severe than the improper use of the independent brake;" (2) when the independent, or locomotive brake handle is depressed while it is in the Application Zone, locomotive brake pressure will be reduced to the pressure corresponding to the position of the handle; (3) in a slack-stretched condition, the engineer must prevent the locomotive brake from applying to reduce buff force at the head end; (4) the locomotive brake handle must be depressed for at least 4 seconds per unit in the locomotive consist to prevent the locomotive brake from applying during an automatic brake application. The timetable in effect for the Hammond District and ICG's other operations in Louisiana and Mississippi at the time of the accident contained comprehensive special instructions for the guidance of traincrews involved in hazardous materials accidents and incidents. (See appendix C.) These instructions included the required response and notification procedures with pertinent telephone numbers, information on special hazards and precautions, and detailed instructions for providing on-scene emergency personnel with the emergency response data printed on the consist, hazardous materials waybills, and the hazardous materials guidebook kept in the caboose.

Supervision of Traincrews

Outbound conductors and rear brakemen report at the North Baton Rouge Yard office, whereas the engineers and head brakemen report directly to the diesel shop at Baton Rouge Junction, about a mile away. There was no supervisor assigned to work at night at the diesel shop, and the engineer and head brakeman were not required to register upon reporting for duty. A general yardmaster worked out of the yard office at night. He had a pickup truck which he used to transport crews and to move about the terminal as his duties required. An operator-caller was on duty at the yard office. His duties included calling crews to report, arranging transportation for crews, and receiving and copying orders and messages for the crews.

ICG's train operations at Baton Rouge and over the three operating districts radiating from that city were supervised by a terminal superintendent, two trainmasters, three assistant trainmasters, and a trainmaster-traveling engineer. The trainmasters were headquartered in a building adjacent to the North Baton Rouge Yard office. One worked the day shift, the other at night. According to the night trainmaster, his responsibilities included supervision of the traincrews at Baton Rouge and on the Hammond District. He testified that he was required to perform 20 to 25 efficiency checks monthly, including train speed determinations, and that he additionally tried to be on hand at least once a night when a crew reported for work. The trainmaster recalled that he had last ridden a train on the Hammond District about 6 months before the accident. He estimated that the best running time that could be made by a through freight train between Baton Rouge and McComb, observing the allowable speeds, would be about 2 hours 55 minutes, and that anything less than that would require violating the speed restrictions. The trainmaster also testified that submission by ICG train service employees to a toxicological examination is not mandatory, even in cases where a serious accident has occurred and/or the employees' condition may be suspect.

Although the trainmaster was on duty the night the accident occurred, he had no contact with any member of the crew of Extra 9629 East until after the accident occurred. On April 8, 1982, the trainmaster conducted a radar speed check of a train being operated over the Hammond District by the engineer involved in the Livingston accident. According to the trainmaster, the check established that the train had been running faster than the allowable speed. However, the train was not stopped and the engineer was not examined. He subsequently was disciplined on the basis of his admission of fault.

The general yardmaster at Baton Rouge, the transportation superintendent, the senior division trainmaster, and the trainmaster at McComb all testified that they had face-to-face contact with the engineer and head brakeman of Extra 9629 East on the night of the accident and found no fault with their condition. None of the supervisors asked the engineer and head brakeman to submit to a toxicological examination. Two Livingston Parish deputy sheriffs also testified that, after the accident, they had talked with a person who said he was a member of the traincrew. Both stated they took no exception to the condition of the man, who, from their description, probably was the head brakeman.

Meteorological Information

At 4:52 a.m., September 28, 1982, the National Weather Service station at Baton Rouge, 27 miles west of Livingston, recorded clear skies with fog, and ground visibility of

2 miles, a temperature of 57° F, and northeasterly winds at 4 mph. Witnesses reported that there was no atmospheric restriction to ground visibility in the Livingston area at the time of the accident.

During the remainder of September 28, the Baton Rouge weather station recorded light southeasterly winds and temperatures ranging between 58° and 64° F. The fog had cleared and visibility had improved to 7 miles by 9:52 a.m. During the next 7 days, the weather was relatively stable in the area with daily temperatures ranging between 60° and 89° F. Winds remained light and easterly. The only appreciable precipitation during this period occurred on October 2, when there was light to moderate rainfall at Livingston throughout the afternoon.

Response to the Emergency

When the conductor of Extra 9629 East first boarded the caboose, he came into possession of the waybills and a consist list for the 63 cars of his train that had originated at Geismar. These documents had been left there by the conductor of Extra 8099 North. Earlier, the general yardmaster had given him the waybills and two copies of a consist list for the 38 cars that had been assembled in North Baton Rouge Yard. The consist lists for both portions of the train were of the "one-line" variety (all of the information given for each car was contained on a single line) with the cars listed by number from head to rear. The information included an alphabetical designation of the car type and its status as loaded or empty; a commodity code; and abbreviated consignee, destination, and routing information. If a car contained a dangerous placarded commodity, the commodity code included the letter "D." However, the commodity and its "UN" code number 14/ were not named, and there was no placard or emergency procedure information as is provided in the complete "nine-line" consist, which, in this case, was prepared later for teletype tranmission and would have been provided to crews handling the train beyond McComb. The waybills in the conductor's possession included the names of the hazardous commodities and their shippers, the "UN" numbers, and the placard information. Additionally, the conductor had access to a hazardous materials guidebook kept in a sealed container mounted above his desk in the caboose. 15/

The investigation developed that only the conductor and rear brakeman had access to the waybills, consist lists, and the hazardous materials guidebook. Although a rule in the timetable required the conductor to advise the engineer of the location of all placarded cars in the train, this was not done before or after the accident. Another timetable rule required the traincrew to immediately notify the dispatcher of the accident and to inform him of any hazardous materials that were involved. In addition, the conductor was required to advise emergency forces of the contents of hazardous materials cars and to provide them with appropriate response data.

Following the accident, the conductor did not inform the engineer or the dispatcher of the location of the placarded cars in his train. Instead, he disconnected the caboose radio from its fixed antenna, locked the caboose doors, and started walking east with

14/ The 4-digit "UN" number identifies an individual or class of hazardous material. The numbers are prominently displayed in place of the commodity names on tank car placards.
15/ Association of American Railroads Bureau of Explosives guidebook "Emergency Handling of Hazardous Materials in Surface Transportation," 1977 edition. It includes emergency response information for the various hazardous commodities transported by rail but does not include the "UN" numbers inasmuch as this edition predated the development of that identification system.

the rear brakeman to determine the extent of the emergency. He could no longer communicate with the dispatcher through the microwave system, but he could use the radio to talk with the head-end crewmembers. He had the waybills and the consist lists with him, but had left the hazardous materials guidebook in the caboose. The conductor later used a public telephone to inform the dispatcher of the hazardous materials in the derailment.

Shortly after the derailment occurred, an off-duty Livingston policeman drove to the accident site and reported the derailment and fire to the parish sheriff's dispatcher. About 5:20 a.m., he encountered the conductor and rear brakeman and drove them to the west end of the derailment where they were able to determine the number of the westernmost derailed car. In the meantime, the head brakeman had been driven to the east end of the derailment and had established the number of the easternmost derailed car. He radioed this to the conductor who then advised the policeman that vinyl chloride and other hazardous materials were in the derailment. The policeman relayed the information to the sheriff's dispatcher and requested that Highway 190 be closed through Livingston. The information was also passed on to the mayor of Livingston, who, at about 5:30 a.m., ordered the police chief to immediately begin evacuating the town's residents. The evacuation was essentially completed by about 6:30 a.m.

Table 1.--Chronology of events following derailment of Train Extra 9629 East.

September 28

5:12 a.m.	Extra 9629 East derails at Livingston. Livingston's fire chief sees fireball, dispatches two fire units, and proceeds to scene. Livingston Parish Sheriff's dispatcher in courthouse hears the derailment and notes brief loss of electric power.
5:13 a.m.	An off-duty Livingston policeman advises sheriff's dispatcher that a train has derailed and is on fire.
5:15 a.m.	Engineer of Extra 9629 East informs ICG's Hammond District dispatcher of the derailment and its location.
5:20 a.m.	Livingston policeman encounters conductor, takes him to derailment area, and they identify westernmost derailed car. Head brakeman radios conductor identification of easternmost derailed car.
5:25 a.m.	Sheriff's dispatcher notifies Louisiana State Police (LSP) dispatcher at Baton Rouge that an emergency exists at Livingston.
5:30 a.m.	Fire chief decides to close Highway 190 and to begin evacuation of southeastern section of Livingston. Conductor informs mayor of Livingston that vinyl chloride and other hazardous materials cars are derailed. Mayor instructs police chief to evacuate the town.

5:34 a.m.	State Police dispatcher begins notifying LSP hazardous materials unit personnel.
5:44 a.m.	LSP notifies State's Office of Emergency Preparedness.
5:55 a.m.	Mayor of Livingston sets up temporary command post in courthouse.
6:00 a.m.	LSP hazardous materials specialists, the conductor, and ICG supervisors meet at courthouse and begin tabulation of hazardous materials cars in derailment.
6:28 a.m.	LSP notifies National Response Center at Washington, D.C.
6:30 a.m.	LSP specialists and ICG supervisors begin contacting shippers and requesting their onsite assistance. LSP tactical unit with mobile command post and helicopter arrive at Livingston.
8:30 a.m.	Commander of LSP designated as commander of overall response to the emergency; main command post established at intersection of I-12 and State Route 63 south of Livingston.
11:30 a.m.	Lieutenant Governor, acting in Governor's absence, declares Livingston a disaster area. Court empowers LSP and other experienced enforcement agencies power to remove residents from evacuation area.
6:00 p.m.	Evacuation zone enlarged to 5-mile radius of Livingston.
<u>September 29</u>	
12:05 a.m.	Tank car containing motor fuel anti-knock compound explodes and rockets.
7:00 a.m.	LSP extends evacuation area northwest of Livingston.
9:30 a.m.	Initial team enters derailment site to assess situation and identify car locations.
12:00 noon	Louisiana Governor David Treen arrives at site to personally assess the situation.
2:45 a.m.	ICG relief train removes remaining underailed cars (16) from west end of derailment site.
<u>September 30</u>	
2:00 p.m.	As fires intensify, vinyl chloride cars begin venting intermittently through their relief valves.

	LSP establishes ground observation or forward command post on U.S. 190 about 2,000 feet east of derailment site. The facility included a decontamination/washdown station.
October 1	
3:00 p.m.	Observers note changes in venting pattern of vinyl chloride cars and evacuate forward command post.
3:22 p.m.	Vinyl chloride car explodes and rockets.
October 2	Forward command post re-established. Broken water main closed. Collection and removal of chemical-contaminated water started.
October 3	Assessment team draws sample from styrene car to determine stability of the chemical.
October 4	ICG begins vacuum transfer of pellets from covered hopper cars on east end and rerailing tank cars on west end.
9:00 p.m.	Styrene monomer re-ignites while car is being lifted for movement. Workers flee, but firefighters extinguish fire.
October 5	
12:20 a.m.	Styrene vapors observed and it is decided to re-ignite the car.
3:34 a.m.	LSP detonates styrene car after evacuating forward command post.
1:00 p.m.	Last of styrene burns off and forward command post is re-established.
	Firefighters extinguish burning oil cars, and salvage work is resumed.
October 8	ICG begins rerailing cars on east end.
October 10	
5:35 p.m.	LSP detonates six remaining vinyl chloride cars to vent and burn off remaining chemical.
October 11	LSP again detonates three vinyl chloride cars still burning.
	Evacuation area reduced to within 2-block radius of derailment site.

October 12	Remaining Livingston residents allowed to return to their homes.
October 16	ICG removes last derailed cars from accident site.

The mayor set up a command post at the Livingston courthouse at about 5:55 a.m. and began working with the conductor to identify the derailed hazardous materials cars and their shippers. They were joined by a Louisiana State Police trooper who had a guidebook with the "UN" numbers. Two State Police hazardous materials specialists were immediately sent to the command post, and by 6:30 a.m., they had begun contacting shippers and requesting their onsite assistance. At about this time, also, the State Police tactical unit arrived with a helicopter and a mobile command post with sophisticated communications equipment. The command post was set up at the intersection of Interstate highway 12 and State Route 63, about 2 miles south of the derailment. 16/ Early response by the State Police also included the setting up of road blocks by enforcement units, and the notification of appropriate State, Federal, and industry agencies. By 8:30 a.m., the State Police had assumed the overall coordination of the response effort, and by 11:30 a.m., the Lieutenant Governor of Louisiana had issued a proclamation designating Livingston as a disaster area. The evacuation was expanded by 6:00 p.m., on September 28, to include a total of about 2,700 persons within a 24-square-mile area around Livingston.

On September 29, the State Police set up a temporary forward command post on U.S. 190 about 2,000 feet east of the derailment site. Working from this location and using the helicopter and an armored vehicle, the State Police maintained close-in videotaped surveillance at the derailment site in an effort to identify the locations of the most critical hazardous materials cars and to monitor the fires. Dense smoke and fire damage to the cars made this difficult. It was also uncertain as to what was actually feeding the fires. For these reasons and because of the rocketing of cars on September 29 and October 1, it was necessary to delay efforts to bring the fires under control and to contain chemicals escaping from damaged cars.

The location of a highly-reactive metallic sodium car was not firmly established until October 3. By this time, the vinyl chloride and plastic pellet fires had begun to cool down and ICG had begun car unloading and rerailing operations at the outer ends of the derailment area. After the fire in the styrene monomer car had been extinguished and holes in its tank had been plugged on October 4, an effort was made to lift the car for rerailing; when a leak recurred and the fire re-ignited, the effort was abandoned. The car was detonated the next day. Similarly, the six vinyl chloride cars still in the wreckage were determined to be too badly damaged to transfer their loads and they were detonated on October 10. After the last of the vinyl chloride had burned off, the residents of Livingston were allowed to return to the town at 8:00 a.m. on October 12.

Livingston had no contingency plan for the evacuation of the town in case of an accident such as this. In his testimony at the Safety Board's public hearing, the town's mayor acknowledged that the accident graphically illustrated the need for such a plan,

16/ This served as headquarters for the response forces throughout the emergency. The site was considered to be a safe distance from the derailment area and it permitted quick access to and from the State Capital and the petrochemical companies at Baton Rouge. The location also permitted maximum control over access to the emergency area, had adequate space for vehicle parking, and was adjacent to an open area suitable for use as a heliport.

and he pointed out that had the derailment occurred later in the morning after the school had opened, serious complications could have resulted. The Louisiana State Police had a Hazardous Materials Awareness Program which addressed the evacuation problems that a hazardous materials train derailment could create if it occurred in heavily populated or congested areas, or in the vicinity of schools, hospitals, and other buildings housing large numbers of people. This program, for the most part, focused on urban areas.

Perchloroethylene

More than 14,000 gallons of perchloroethylene, or tetrachloroethylene, a concentrated cleaning solvent, were spilled and absorbed into the ground from a tank car that sustained shell punctures and bottom outlet damage in the derailment. Characteristically, perchloroethylene does not readily bind to the soil and tends to move rapidly through the soil strata. Reportedly, it has been in production for about 15 years, and in 1981 was nominated for cytogenic and carcinogenic testing in the National Toxicological Plan on the basis of animal test data. It is not regulated by the Department of Transportation's Materials Transportation Bureau (MTB) as a hazardous substance, and the tank car carrying the chemical was not required to be placarded. The shipment's waybill did not include any product or emergency response information. The Safety Board has learned that the Environmental Protection Agency (EPA) has completed toxicological testing of perchloroethylene and will issue a notice of proposed rulemaking to establish a minimum spill quantity for mandatory reporting purposes. The Safety Board has also been informed that MTB will assign a hazardous materials classification to perchloroethylene for transportation purposes, if and when EPA issues a final rule.

About two weeks following the derailment, after wrecking and clearing operations had been started by ICG and the residents of Livingston had been allowed to return to their homes, the Louisiana Department of Natural Resources (DNR) detected perchloroethylene in concentrations of 25 parts per million (ppm) in the soil at the derailment site. It also discovered that the chemical had migrated well beyond the location where it had been spilled. Facilitating this migration was the spreading of the contaminated soil over the general derailment area by bulldozers. Heavy rains and flooding, particularly during April 1983, have since aggravated the problem with the contaminated area now encompassing about 10 acres along and on both sides of the railroad and Highway 190.

Most of Livingston's drinking water is obtained from wells tapping a deep aquifer, but there are a number of shallow wells in the area, and DNR decided that precautions needed to be taken to prevent the contamination of ground water by perchloroethylene. DNR established 0.3 ppm of perchloroethylene as its criteria for maximum safe level of contamination by the chemical. Excavation of the release site was begun in October 1982, with 35,000 cubic yards of contaminated soil being removed from a pit 22 feet deep, 65 feet wide, and 120 feet long. (See figure 8.) More than 25,000 cubic yards of soil have since been excavated from two additional pits, and it has been estimated that ultimately it will be necessary to remove an additional 40,000 cubic yards of soil contaminated by perchloroethylene.

Tests and Research

Based on the calculation that Extra 9629 East was 5,281 feet long and the fact that the train required 91.8 seconds to pass over the hotbox and dragging equipment detector at Lockhart, the train's speed averaged 39.22 mph as it passed over the detector. Following the accident, the ICG calibrated the speed indicator on locomotive Unit 9629 and found that indicated speed was 1.5 mph faster than actual speed at 20 mph; 2 mph faster at 40 mph; and 4 mph faster at 80 mph.

Figure 8.--Aerial view of derailment site taken on November 4, 1982, after the excavation of perchloroethylene-contaminated soil had begun.

The locomotive consist of Extra 9629 East was not changed after it arrived at McComb, and it was subsequently dispatched to Memphis, Tennessee. There, on September 29, 1982, a FRA Motive Power and Equipment inspector thoroughly inspected the locomotive units and the car that had been immediately behind the locomotive before and after the accident. The inspector found that the air hose coupling on the trailing end of the trailing unit (Unit 3022) was badly worn and battered, with about one-third of the coupling flange worn away on the lower side. According to the inspector, the wear apparently resulted from the coupling dragging over the track structure, grade crossings, and so forth, when it was not coupled to the air hose of another locomotive or car. The hose was on the designated front end of the unit, and, according to the inspector, there was no support bracket to hold the air hose when it was not in use. The investigation developed that prior to being assigned to Extra 9629 East, Unit 3022 had last been used as the lead locomotive unit on a train and that the air hose on the front end had probably not been used during that trip.

According to the FRA inspector, ICG applied a hose support bracket to the front end of Unit 3022 after his inspection. The air hoses from the facing ends of Unit 3022 and the head car of Extra 9629 East were removed and exhibited at the Safety Board's hearing into the Livingston accident. While testifying, the FRA inspector demonstrated that the two air hoses could easily be pulled apart by hand. According to the inspector, he did not observe any other defective condition in the locomotive consist during his inspection.

The Safety Board had the two air hoses tested at the Westinghouse Air Brake Company's laboratory in Wilmerding, Pennsylvania. In testing, the coupling on the Unit 3022 air hose would not accept the Association of American Railroads (AAR) gage used to determine whether or not a coupling will align properly with the corresponding mating surface of another coupling. (See figure 9.) Tests also indicated that it required less vertical travel and vertical lift force to separate the air hoses taken from Unit 3022 and the car next to it than was required to separate new air hose couplings. Examination of the hose from the locomotive unit also revealed that the coupling was not attached to the Unit 3022 hose in conformance with the AAR recommended practice. (See appendix E.)

During the wreckage clearing operations, it was discovered that there was a 7-inch remnant of the center pin lodged in the bolster of what had been the trailing truck of the 20th car, gondola EJ&E 4712. Examination of the underside of this car revealed wheel strike marks as well as longitudinal abrasions across the trailing body bolster and the first and third crossbearers ahead of the bolster. The direction of the marks indicated that they were made when the carbody was moving north or the trailing truck was moving south. There was no thermal evidence to indicate that prolonged contact and overheating had occurred. Neither the male nor female center plate castings showed evidence of forced override, and there was no mark on the female center plate to indicate that the upper remnant of the center pin had been dragged across it. (See figure 10.) The upper remnant of the pin was not found at the derailment site.

In a preliminary report dated October 27, 1982, 17/ a metallurgist retained by the ICG stated that the wheel marks on the underside of EJ&E 4712 indicated that the truck had been off center and its wheels had been in contact with the car for a "considerable period of time immediately before the derailment." The report also stated that grinding of the wheels against the car had caused heating of the opposing surfaces to approximately 600° F. The metallurgist concluded that contact had occurred over a distance of one-fourth to one-half mile before the car derailed.

17/ Preliminary Report No. 48064, Taussig Associates to ICG, October 27, 1982.

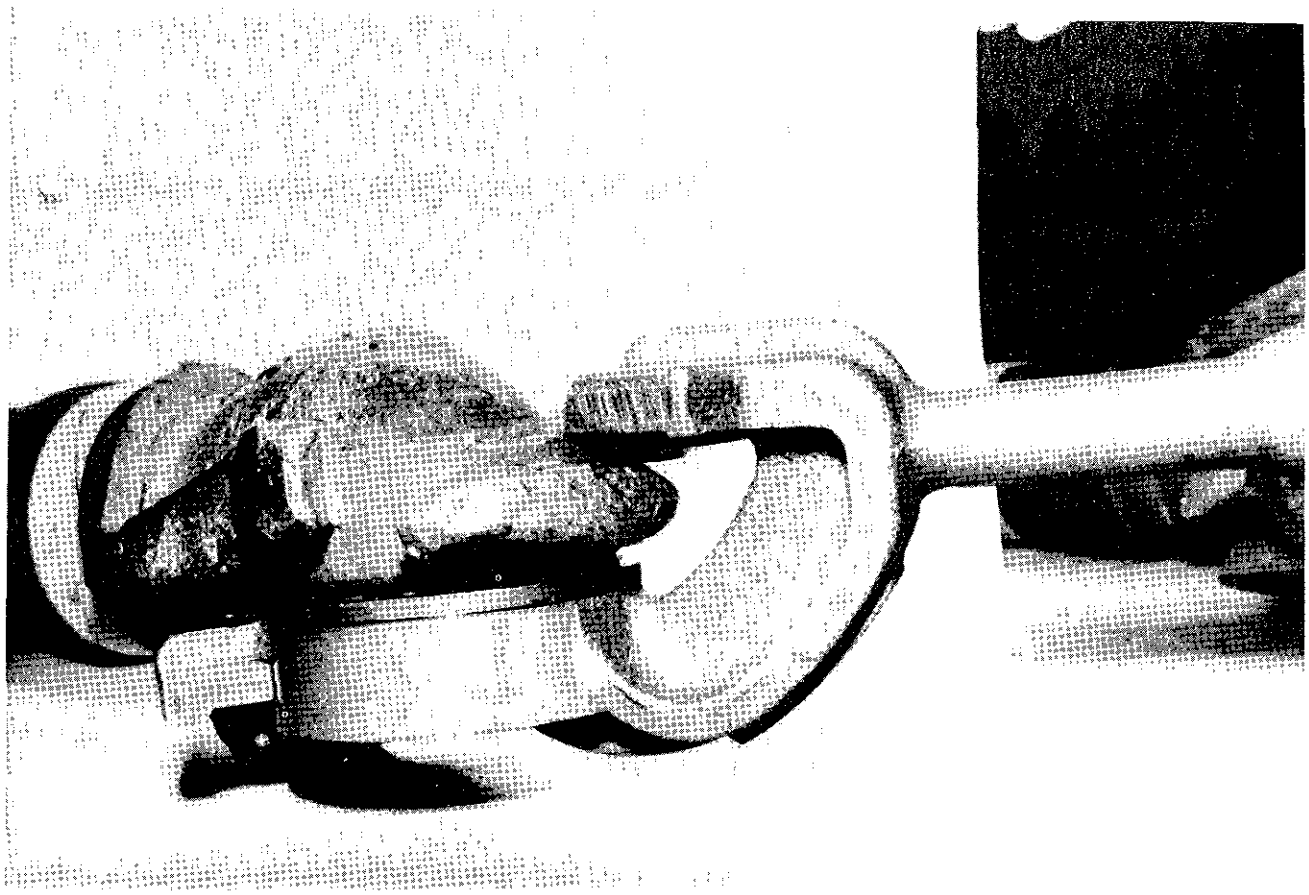

Figure 9.--AAR gage applied to air hose coupling from ICG Unit 3022. The gage could not be fully or properly applied.

The trailing truck's bolster and wheels were subsequently taken to the metallurgist's laboratory. It was necessary to saw the bolster into two pieces in order to remove the center pin remnant which was bent and had been heavily mushroomed at the fracture face. (See figure 11). In his final report, 18/ the metallurgist stated that the mushrooming of the lower center pin remnant resulted from repeated battering by the upper remnant over a long period of time. This was subsequently confirmed upon examination of the pin by the Safety Board's metallurgists. The wheels were radially sectioned, ground, and etched to reveal their microstructure and heat pattern. None of the wheels revealed any abnormal heat pattern, but the ICG's metallurgist concluded that intense heat generated by the rocketing and detonation of the vinly chloride cars had obliterated thermal evidence.

18/ Report No. 48064-B, Taussig Associates to ICG, January 27, 1983.

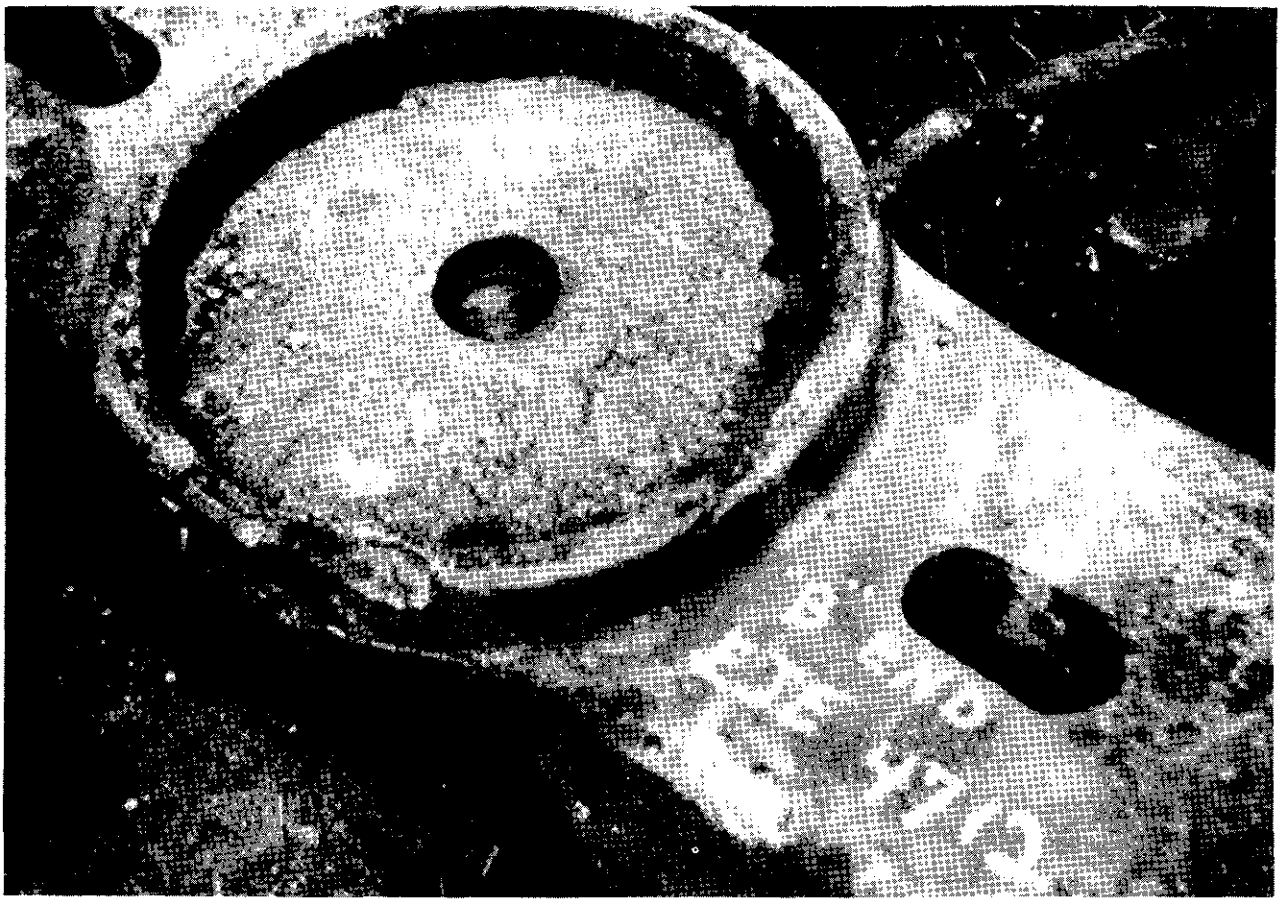

Figure 10.--Center plate of trailing truck bolster, gondola EJ&E 4712, with lower remnant of center pin lodged in the bolster.

Eyewitnesses driving west on Highway 190 at the time of the derailment stated that they saw sparks under a car in Extra 9629 East just before the derailment occurred. At the time, they were apparently in the vicinity of the culvert and pulled off the road at the School Board crossing, about 1,200 feet west of the culvert.

The fractured joint bars were examined by ICG's metallurgist and the Safety Board's metallurgist on December 31, 1982. The bar on the gauge side of the rail exhibited characteristics of fatigue cracking in two regions. The larger of these two regions was in the head with initiation from numerous places along the interface with the rail. Fatigue propagation was downward to a depth of about 1 1/4 inches. The second fatigue area was in the toe with upward propagation of about 1 inch. Approximately 30 percent of the fractured cross section of this joint bar was cracked by slow growth fatigue. Most of the fracture between the two fatigue regions was typical of fast propagation stemming upward from the toe.

Examination of the field side joint bar disclosed a fatigue crack in the toe region with upward propagation to a depth of about one-half inch. Rapid fracture stemming upward from the fatigue region was indicated.

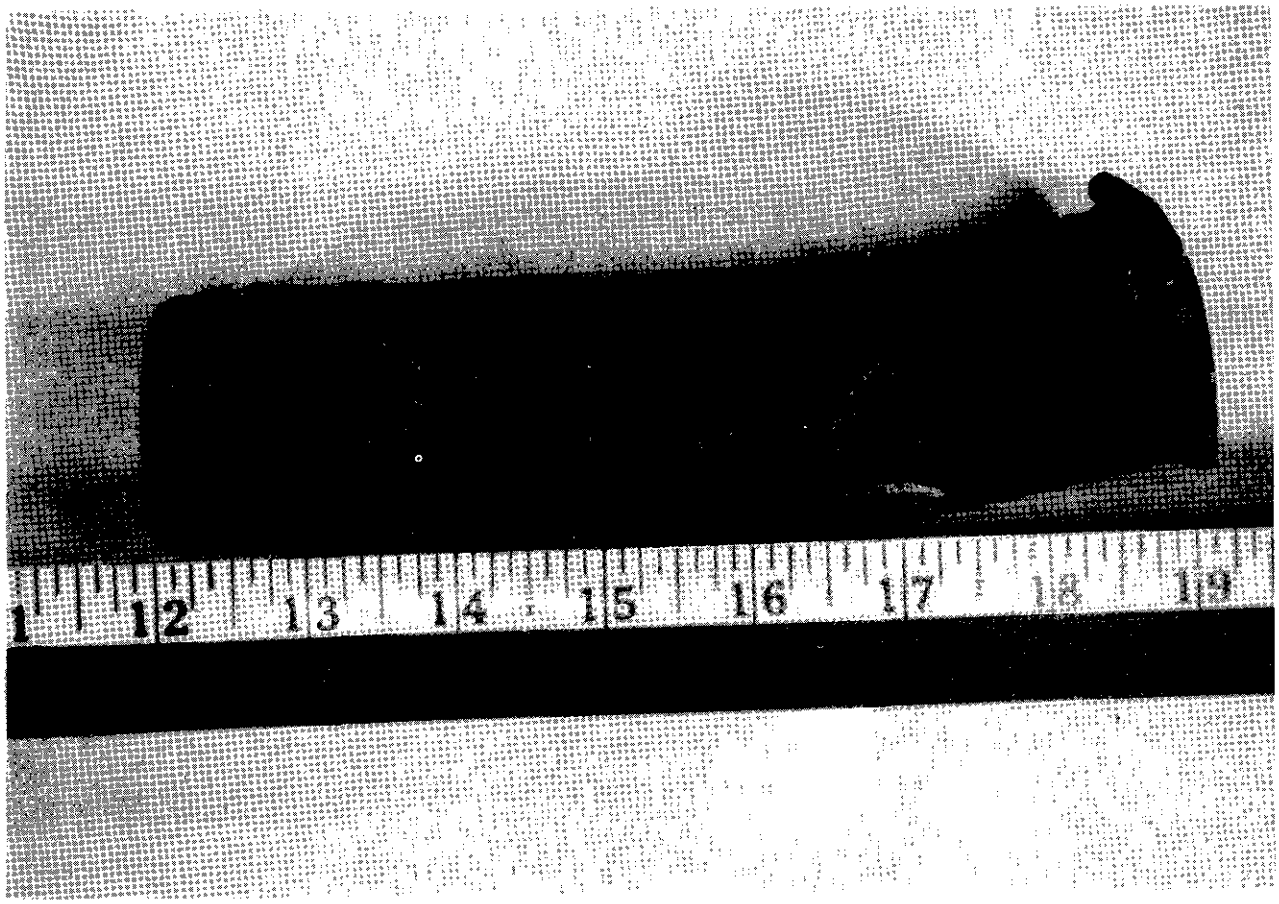

Figure 11.--Center pin remnant removed from truck bolster of EJ&E 4712. Fracture face mushroomed by battering from upper remnant over a prolonged period.

According to the Safety Board's metallurgist, the deformation of the rail heads at the joint appeared to have been caused by repeated pounding by wheels moving in both directions. The extent of batter, or deformation, was considered to be consistent only with the rails being separated either vertically or horizontally as a result of complete fractures of both joint bars.

Following the accident, the ICG performed a series of simulations on its Train Dynamics Analyzer (TDA) based on the physical features of the Hammond District, the characteristics of Extra 9629 East, and what was then known of the handling of the train. A trip was simulated during which all of the speed restrictions between Baton Rouge and Livingston were strictly complied with. The elapsed running time for the trip was 1 hour and 27 minutes, and the average speed attained was 27.26 mph. In a second test, an effort was made to duplicate the actual performance of Extra 9629 East, using the times that the train left Baton Rouge, passed over the Lockhart defective equipment detector, and derailed at Livingston. Also taken into account was the statement made by the engineer that the locomotive was operated in full throttle between Lockhart and Livingston, and the calculation that the train had passed over the detector at a speed of between 39 and 40 mph. The simulated run reached the detector moving at 39.4 mph, 46 minutes after leaving Baton Rouge. When it reached the derailment site 12 1/2 minutes later, the speed had reached 51 mph.

Numerous TDA simulations were made to establish the dynamic forces that probably occurred in Extra 9629 East following the emergency brake application and derailment. To gain the broadest possible spectrum of test results, the locomotive's location in the general derailment area was varied slightly from test to test. Emergency application of the brakes was initiated from the locomotive in some tests and from the head car in other tests. Speeds at the time the emergency application occurred ranged from 41 to 53 mph. When the locomotive brake was not allowed to apply, or was "bailed off," 19/ when the brakes went into emergency, no remarkable buff forces occurred within the train. In every simulation where the locomotive brake was allowed to apply, extremely severe buff forces occurred in the forward portion of the train. The computer recorded these forces as ranging from 207,000 to 526,000 pounds. (See table 2.) According to ICG and AAR train dynamics specialists, buff force in excess of 240,000 pounds is sufficient to jackknife and derail cars in motion. In all but one simulation, maximum buff force was registered between the 12th and 23d head cars of the train. Typically, maximum buff force occurred about 15 seconds after the emergency application with the train having traveled about 1,100 feet in the interim.

According to the ICG TDA simulation report, "bailing off," or releasing the locomotive brake 15 to 30 seconds after the emergency application, produced essentially the same results as were noted in the "no release" tests. Also, simulation with the emergency application initiated at the 15th head car with the locomotive brake allowed to apply resulted in an indication of 345,000 pounds maximum buff force at the 23d head car, 17 seconds after the brakes applied.

In her testimony to the Safety Board, the operator-clerk stated that she made a 7-pound application of the train brakes approaching a bridge west of Livingston. From her testimony, it was established that this bridge was 4.1 miles west of the derailment site. The operator-clerk said that the train travelled about a mile before she released the brakes, by which time indicated speed had dropped to 30 to 35 mph. Simulations taking such a brake application into account established a speed of about 45 mph at the derailment site and a stopping distance of about 1,700 feet. With the emergency brake application initiated at the culvert, the location of the simulated stop was milepost 27.22. The operator-clerk was unable to identify the location where the locomotive came to a stop, but she stated that after stopping she moved the locomotive ahead about 15 to 20 car lengths (750 to 1,000 feet) and that the locomotive was then about 15 car lengths west of the Doyle woodyard (milepost 27.5). She also stated that shortly afterward the engineer attempted to back the locomotive. Following the accident, light wheel burn marks were found on the rails west of the woodyard at about milepost 27.47.

Other Information

ICG Management

According to the railroad's vice-president of operations, ICG management gave employee and public safety the highest possible priority. He said that since 1978, ICG had succeeded in substantially reducing the incidence of reportable employee injuries, as well as train derailments. He added that ICG had a staff-level manager for its safety program who reported directly to him and that there were four assistant superintendents of safety in the field. The division transportation superintendent stated that the assistant

19/ "Bailing off" is the term commonly used to describe the engineer's depressing of the locomotive, or independent brake handle, to prevent the locomotive brakes from applying during the application of the train brakes.

Table 2.--ICG Train Dynamics Analyzer (TDA) Simulations
Train Extra 9629 East at Livingston.

Compressive Buff Forces Generated Following Emergency Brake Application of Automatic Air Brake with Locomotive Brake Allowed to Apply

Locomotive Speed at Emergency Application (MPH)	Maximum Buff Force Registered	Location (Car Number from Head End)	Emergency Application to Maximum Buff Force Time	Distance	Locomotive Speed at Maximum Buff Force (MPH)
41.1	421,000 lbs.	17	16 secs.	920 feet	34.8
41.3	448,000	23	16	880	35.7
42.8	491,000	17	17	1,080	35.3
42.8	341,000	17	14	960	37.0
	285,000 **	19	16	1,020	35.0
45.1	289,000	17	16	980	38.7
45.3	225,000	12	12	820	40.7
45.6	207,000	77	14	900	39.1
	126,000**	16	17	1,060	38.0
46.1	240,000	22	13	920	41.1
* 50.1	320,000	18	15	1,160	43.8
50.2	320,000	15	14	1,160	44.9
50.4	238,000	21	15	1,100	45.2
* 51.0	363,000	16	15	1,140	45.6
* 51.2	335,000	14	14	1,100	46.0
51.3	307,000	14	16	1,120	46.0
51.5	261,000	20	14	1,100	45.0
52.3	346,000	22	16	1,220	45.5
53.0	526,000	16	16	1,300	45.9

* Emergency application initiated from locomotive; all others from head car in train

** In these two simulations, there were two episodes of severe buff force.

superintendent of safety assigned to his division had a broad background as a transportation supervisor. He described his duties as including the conducting of staff and employee safety meetings over a large four-state territory. According to the superintendent, the safety officer did not ordinarily become involved in train operation safety and did not participate in rules training classes or supervisory efficiency checks.

ICG had a hazardous materials specialist headquartered in Chicago who conducted hazardous materials training classes for employees and was responsible for maintaining liaison with local emergency forces. The investigation developed that neither the general yardmaster at North Baton Rouge nor the conductor and rear brakeman of Extra 9629 East had received hazardous materials training. According to Livingston's fire chief, his department had never been contacted or assisted by ICG hazardous materials personnel.

The transportation superintendent stated that there were 35 trainmasters and traveling engineers on his division. He also stated that, in addition to Baton Rouge, there were four terminal locations where such supervisors were regularly assigned a nighttime tour of duty, and that there were several locations with a single supervisor whose tour of duty included some of the night shift. The superintendent described the division's operations as split about evenly between night and day, 7 days a week.

The ICG vice-president of operations stated that he had no idea of the extent of alcoholism amongst the railroad's train service employees, but he testified that ICG had an active employee rehabilitation program to deal with the problem. According to the transportation superintendent, a number of employees on his division were enrolled in the program which was administered locally by a company counselor. He stated that any employee discharged for violation of Rule "G" would have to go through the rehabilitation program before he would be considered for rehiring. Recommendations for rehiring, according to the transportation superintendent, were originated at his level of the ICG organization and had to be approved by the division manager.

"Good Samaritan" Legislation

Shortly after the accident, ICG supervisors and State Police hazardous materials experts began contacting the shippers of the hazardous materials involved in the derailment requesting their onsite assistance. Ten chemical companies sent emergency response teams to Livingston to provide the expertise and special equipment to assist the emergency forces, in spite of the fact that Louisiana has no "Good Samaritan" law to protect them from claims that might arise from their participation. On the first day following the accident, the State Police coordinator of the overall emergency response announced that he would make all decisions regarding actions to be taken during the emergency and would assume full responsibility for those decisions. He stated that he would need input from the chemical company teams regarding potential chemical behavior and the formulation of the best courses of action. On this basis, most of the chemical company representatives provided valuable assistance throughout the operations that followed.

Some form of "Good Samaritan" legislation has been enacted in 12 states, but there is little uniformity in what these laws provide in the way of liability protection to individuals and companies. According to the Chemical Manufacturers Association (CMA), a party to the Safety Board's investigation of this accident, there is no legal responsibility on the part of chemical companies to respond to an emergency, even if a commodity they manufactured and loaded in a car is involved. The transportation carrier assumes the full responsibility for safely transporting the commodity. Nevertheless, the chemical

companies have responded in the past to hazardous materials emergencies because they alone have in-depth knowledge of the commodities and the best means of dealing with them. According to CMA, there has been a growing reluctance on the part of the chemical companies to assist in emergencies in states where no protective laws exist and thus to expose themselves to potential liability.

ANALYSIS

Makeup of Extra 9629 East

Extra 9629 East was the September 28, 1982, Illinois Central Gulf through freight train GS-2. Operated every night, GS-2 was made up for the most part of the products of the Baton Rouge-New Orleans petrochemical complex and invariably included a variety of hazardous and volatile commodities hauled in tank cars -- chlorine, flammable compressed gasses, flammable liquids and solids, poisons, combustibles, and corrosives. Routinely included in the train were as many as 75 to 100 or more loaded tank cars destined for locations scattered across the Midwest and Northeast. Everyone on the railroad who had a role in the train's makeup, inspection, handling, and supervision, as well as a broad spectrum of people not actually engaged directly in train movements, including top ICG management responsible for making policy and communicating it to division-level management, those who directed ICG's safety and training programs, and the division engineers and trackmen responsible for keeping the Hammond District and the rest of the ICG safe for the operation of heavy hazard materials trains, should have clearly understood the potential risks involved should the train derail. The movement of hazardous materials in rail transportation requires great dedication to safe train operation and a high degree of professionalism throughout the organization. The Safety Board found little evidence of these high standards in the ICG organization.

As a matter of standard practice, the cars in GS-2 were classified, or assembled, in destination blocks. As a result, the two forward blocks, which had been added at Baton Rouge, each contained a pair of empty cars. From a train dynamics standpoint, these cars were in extremely vulnerable locations should an emergency application of the brakes occur with the slack stretched. 20/ It would have been simple, even desirable from an operations standpoint, to have corrected the situation at Baton Rouge. The lead block, destined for McComb, could have been consolidated with the McComb block on the rear of the train. Similarly, placing the two empty gondola cars, that were in the second Baton Rouge block, behind the Chicago block out of Geismar would have expedited their movement by eliminating the need to switch these cars farther up the line. More importantly, these changes would have resulted in no empty car being nearer than the 44th car from the head end, consequently reducing substantially the risk of a car being jackknifed by excessive buff forces.

The general yardmaster, who was responsible for switching operations and the assembly of Extra 9629 East at Baton Rouge, was not required to determine whether a train's profile was safe, nor was he required to perform the switching to make it so. He could have contacted the night trainmaster for guidance in a questionable case, but he had not received the training in train dynamics or hazardous materials that ICG had provided to some of its employees. Hence, the general yardmaster was not likely to have perceived the danger inherent in a train such as Extra 9629 East.

20/ This is based on the tonnage of the train, its power, and the level terrain it was to operate over. This vulnerability would exist even when slowing or stopping, as ICG-train-handling rules required the use of the train brakes and/or dynamic braking in such a situation. The locomotive of Extra 9629 East was not equipped with the dynamic braking feature.

Inspection of Train Equipment

The lack of a holding bracket had allowed the trailing locomotive unit's front end air hose to strike obstructions between the rails whenever this unit had been used to lead a locomotive consist and the hose was not in use. The air hose coupling was battered and worn to the extent that it would become uncoupled when subjected to severe vertical lift or force. The critical degree of wear might have been reached when the unit brought a train into Baton Rouge on September 27. The unit was inspected while laying over during the day at the diesel shop, but the lack of a bracket and the worn coupling apparently went unnoticed. The air hose became uncoupled shortly after it was charged, and the locomotive began moving to couple the two parts of Extra 9629 East together at North Baton Rouge Yard. No trouble with the hose was encountered on the welded track between Baton Rouge and Livingston, but the hoses again parted after the derailment when the locomotive and head-end cars were leaving Livingston for McComb. The testimony of the operator-clerk that the train had gone into emergency braking "2 to 3 seconds" after the lead unit "bottomed out" severely at the derailment site suggests strongly that the air hoses had also parted at that time.

The "bottoming out" probably occurred at the joint with the broken bars at or close to the culvert at milepost 26.8. The location was a chronic soft spot, with visibly pumping mud at the joint, which had required regular attention over the years. The bars were worn and bleeding rust from center cracks indicated fatigue and service abuse. For some reason which ICG could not explain during the investigation, ICG had relaid 1.4 miles of the main track at Livingston with jointed rail while relaying most of the rest of the Hammond District with welded rail. Pumping joints and center-cracked and broken joint bars were a chronic problem in the jointed section. As recently as 5 months before the derailment, a Louisiana Department of Transportation track inspector had found three center-cracked joint bars in the section. The ICG track inspector and section foreman should have been on the lookout for this type of failure, particularly at pumping joints. Although they made four inspections of the jointed track during the week preceding the accident, they failed to detect and replace the cracked bars at the culvert. This is an indication that ICG inspectors have been conditioned to accept defects or that they do not make thorough enough inspections to discover them.

After the joint bars failed, the opposing rails would no longer stay in vertical alignment as the wheels of a train passed from the one rail to the other. The pattern of batter deformation of the two rail heads indicated that trains had passed over the joint in both directions after the bars had separated. The last westbound train to pass the location was MG-5-27 on the evening of September 27, manned by the same crew that was on board Extra 9629 East. The caboose of MG5-27 "bottomed out" at the joint. That this actually happened was confirmed by the conductor in an early statement that he later retracted. However, after Extra 9629 East went into emergency braking at Livingston, the conductor was recorded on the microwave radio tape referring to ". . .one of them bad holes." (See appendix D.) The conductor should have reported the incident to the dispatcher or to someone in authority at Baton Rouge on the previous trip. Failing this, he should have at least instructed the engineer on the return trip to approach the location prepared to stop. Had there been automatic block signals on the Hammond District, the signals might have been shunted by the joint bar separation and would have displayed "stop" aspects approaching the location from both directions. The lack of such protection made it all the more imperative that the conductor respond to the potential danger of the "bad hole" at Livingston.

Performance of Train Crewmembers

MG-5-27 had covered the 94 miles from McComb to Baton Rouge in 2 hours and 40 minutes, a "very good run" in the words of the Baton Rouge night trainmaster, and one that could not have been made without violating the speed restrictions. Statements made by the engineer and the operator-clerk indicated that from the time it left Baton Rouge, Extra 9629 East was also operated at speeds significantly greater than were authorized. The train should have taken 1 hour and 27 minutes to reach Livingston, but it arrived at Livingston in 1 hour, moving at an average speed of 5 to 10 mph faster than was permitted. Normal running time to the detector at Lockhart was about 67 minutes, but Extra 9629 East made the trip in 46 minutes, and was running more than 14 mph over the allowable speed at the detector. The train's remarkable progress should have been evident to the dispatcher who knew the time the train left Baton Rouge and the time it reached the detector. Even though he knew that this was a hazardous materials train, he made no effort to contact the crew.

After the accident, the conductor stated that he knew that he was in charge of the train and was responsible for its safety. However, his passive role in the operation of the train on the night of the accident contradicted his subsequent acknowledgement of responsibility. Moreover, aside from his failure to report the "bad hole," he apparently took no exception to the way the engineer had handled train MG-5-27. He certainly should have realized that the train was operated much faster than it should have been, but he made no effort to caution the engineer about the train's speed. The conductor had a timetable with a speed table on its cover and he had a watch, but he did not check time against the mileposts to determine how fast the train was moving. Earlier on the night of September 27-28, the conductor failed to tell the engineer about the "bad hole" at Livingston, and he failed to inform him that the crew was to be called back to duty about 3:00 a.m. When it was time to leave the motel, the conductor was not concerned about the whereabouts of his engineer and head brakeman, although he later stated that the crew always left for the train yard together. He did not recall giving the engineer his copy of the train orders, and he did not discuss the orders with him as required. Further, the conductor failed to inform the engineer of the locations of placarded cars in the train.

Once the accident occurred, the conductor failed to follow the detailed and comprehensive hazardous materials emergency instructions in the timetable. Although he was required to notify the dispatcher immediately, and could have at least informed him of the hazardous materials that were in his train, he disconnected his radio from the antenna and left the caboose. In the process, he cut off his only direct means of communicating with the dispatcher. He also left behind the only emergency response information available to him. Since the conductor had the waybills, the dispatcher now had no way to quickly determine what was in the train. Further, the conductor had no way of providing response information to responding emergency personnel. Although the conductor said he had been examined on the timetable and rules in 1982, his record indicated that he had last been examined in 1953. ICG's excellent timetable instructions for hazardous materials incidents are of little value unless the conductors are given training and know the procedures to follow in an emergency. However, attendance at ICG's hazardous materials classes was not mandatory, and the conductor had not received this training.

The engineer's performance on and off the job on the night of the accident was predictable, based on his past record. (See appendix B.) He had been dismissed previously for consuming alcohol while subject to duty. He had allowed an unauthorized and

unqualified employee to operate his locomotive, resulting in a side collision. He had a record of failing to observe speed restrictions, failing to stop in compliance with wayside signal aspects and hand signals, and repeatedly failing to report for his assignments. In all, he had been dismissed twice and suspended six times in his less than 10 years as an engineer. In some instances, he admitted his failures in order to avoid formal hearings and possible discharge, but in every such case, he included a disclaimer of total responsibility and recited the reasons why it had been necessary for him to break the rules. The temporary loss of his job and earnings seems to have had little or no effect on the engineer and the way he did his job, for he continued to perform in the same manner when rehired.

While it was apparently true that the engineer had been told little, if anything, about the makeup of Extra 9629 East, hazardous materials in tank cars constituted a large part of ICG's traffic out of Baton Rouge, and the engineer certainly should have expected such cars to be in the train. He and the head brakeman were the only crewmembers to have received ICG hazardous materials training, and they both should have known of the possible consequences of a derailment involving any number of volatile and toxic substances regularly hauled in their trains. Also, the engineer knew that he had a long and heavy train and that any of a number of conditions could occur within the automatic air brake system which would cause the train brakes to go into emergency braking. He had twice attended ICG train dynamics training courses and had seen TDA simulations of dynamic forces at work in a train. In his statement to the police, he had described the necessity of keeping the slack stretched when emergency braking occurred by "bailing off" the locomotive brake in order to prevent a derailment.

Crewmembers' Use of Alcohol

The operator-clerk said that the engineer told her he understood he would have the full 8 hours rest at Baton Rouge; this may have been true since he was not a regular member of the crew and since the conductor had failed to tell him otherwise. However, the engineer continued drinking after he learned that he was going to have to report back on short rest. His apparent lack of concern for the possibility that he might be caught was well illustrated by his own statements that he continued to drink while en route to the diesel shop and after the train left Baton Rouge. He was publicly quoted as saying that he could ". . .drink with the best of them; I can drink more than most," 21/ and his postaccident bragging to fellow employees that he had a bottle on the train illustrated, as well, his disregard for the opinions of others. The engineer's statement to the operator-clerk that "you can't let it bother you," provides an indication of a poor attitude toward responsibility.

On the basis of testimony taken by the Safety Board, the engineer consumed at least 14 to 16 ounces of 86-proof Bourbon liquor during the 5 1/2 hours preceding the accident. Moreover, he had apparently gone without eating or resting for at least 10 hours prior to the accident. On the basis of his having consumed 14 ounces of liquor, the engineer would have had a blood alcohol level (BAL) when the derailment occurred of approximately .19 percent, 22/ or nearly twice what is considered to be legal intoxication in most States. At this level, according to the National Safety Council Committee on Alcohol and Drugs, he typically would be between the "excitement" and "confusion" stages of alcoholic influence and would potentially experience increased reaction time, lack of muscular coordination,

21/ Baton Rouge State Times, October 15, 1982.
22/ Calculated on the "Alco-Calculator," Journal of Studies on Alcohol, Inc., Rutgers University, Center of Alcohol Studies, 1972.

slurred speech, disorientation, mental confusion, loss of critical judgment, impairment of memory and comprehension, and decreased inhibitions. According to the operator-clerk, the engineer displayed a number of these symptoms both before and after the train derailed.

Following the accident, the engineer was "befuddled, inebriated, and disjointed," according to the operator-clerk. In addition to this statement, other evidence substantiates that the engineer was impaired by alcohol. He did not know his location after passing through one of the only two towns of any size on the Hammond District. His initial efforts to raise the New Orleans Yard by radio instead of the Hammond District dispatcher or the Baton Rouge operator are further evidence of mental confusion and disorientation. He should have instinctively attempted to contact the dispatcher, but he had to be told to do so by the conductor. His inability to properly repeat a simple train order, although the operator-clerk wrote it down for him and coached him as he repeated it, and his failure to relay the order to the conductor attest to impairment of comprehension and memory. Before the train left Baton Rouge, the engineer's speech was slurred to the point that he was told by the head brakeman to "stay off" the radio. Following the accident, the engineer responded to radio inquiries from the transportation superintendent by addressing the man as "Jimmie." This language and obscene terms he used over the radio at a time it was certain to be monitored by officials were unmistakable signs that the engineer had become less than normally inhibited. The engineer's turning the operation of the locomotive over to the operator-clerk, although he knew she was not qualified to replace him, also was an act reflecting impaired judgment.

The head brakeman admitted being served two drinks at the motel lounge, and although he denied drinking any part of the fifth of liquor, both the engineer and the operator-clerk stated that he had drunk from it at the motel. The operator-clerk further stated that the head brakeman had also taken a drink from the bottle on the train. On the basis of available testimony and documentation, the Safety Board believes that the head brakeman consumed at least 9 ounces of 86-proof liquor during the 5 1/2 hours preceding the accident and had an estimated blood alcohol level (BAL) of .06, 23/ when the accident occurred. Although this is below the level considered to constitute legal intoxication in most states, it is likely that the head brakeman might have had impaired alertness, judgment, and inhibitions as a result.

The Safety Board has long been concerned about the adverse impact on the safety of train operations resulting from alcohol-induced impairment of train crewmembers. This concern has been heightened by what appears to be an alarming increase during recent years in the number of alcohol-related accidents and incidents occurring on the railroads.

Historically, the railroads have forbidden the use of alcohol by employees who are on duty or who are "subject to duty," through their virtually universal adoption of "Rule G." However, numerous Safety Board investigations of railroad accidents/incidents have shown that over-the-road train crewmembers are rarely checked for fitness at reporting points and receive only minimal supervision while they are en route. The "subject to duty" provision of Rule G has never specified a mandatory period of abstinence from alcohol use prior to going on duty. Hence, there are no guidelines for employees to follow, nor is there any practical method of enforcing the provision. Following a 1973 collision between two Southern Pacific Transportation Company trains near Indio, California, resulting from the failure of an alcohol-impaired engineer to control his train, 24/ the Safety Board

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23/ Ibid.

24/ See Railroad Accident Report—"Rear-end Collision of Two Southern Pacific Transportation Company Freight Trains, Indio, California, June 25, 1973" (NTSB-RAR-74-1).

in 1974 recommended that the FRA promulgate regulations prohibiting the use of intoxicants and narcotics by railroad employees for a specific period prior to their duty tours, and while they are on duty. Although the FRA subsequently began gathering data on accidents where the use of alcohol and/or narcotics was a causal factor, and supported an industry program to rehabilitate problem drinkers on the railroads, the FRA never took the regulatory action the Safety Board had recommended.

The position of the Safety Board has continued to be that there needs to be a Federal regulation, with appropriate penalties, which prohibits the use of alcohol by train crewmembers on the job and prescribes a specific period of abstinence before crewmembers report to work. Less than a week after the derailment at Livingston, a Missouri Pacific Railroad freight train collided with another freight train near Possum Grape, Arkansas. 25/ The Safety Board's preliminary findings indicated that alcohol was involved. As a result of these accidents, the Safety Board on March 7, 1983, made the following recommendations:

—to the Association of American Railroads:

> In conjunction with the Railway Labor Executives Association, assist the Federal Railroad Administration in developing a requirement that timely toxicological tests are performed on all operating employees involved in a railroad accident which involves a fatality, a passenger train, releases of hazardous materials, an injury, or substantial property damage. (Class II, Priority Action) (R-83-28)
>
> In conjunction with the Railway Labor Executives Association, assist the Federal Railroad Administration in developing regulations and procedures to require that alcohol/drug involvement related accidents/incidents be fully reported to the FRA so that a data base can be developed for devising and implementing effective safety countermeasures to eliminate or minimize accidents involving alcohol/drug abuse. (Class II, Priority Action) (R-83-29)

—to the Federal Railroad Administration:

> Immediately promulgate a specific regulation with appropriate penalties prohibiting the use of alcohol and drugs by employees for a specified period before reporting for duty and while on duty. (Class II, Priority Action) (R-83-30)
>
> With the assistance of the Association of American Railroads and the Railway Labor Executives Association, develop and promulgate effective procedures to ensure that timely toxicological tests are performed on all employees responsible for the operation of the train after a railroad accident which involves a fatality, a passenger train, releases of hazardous materials, an injury, or substantial property damage. (Class II, Priority Action) (R-83-31)

25/ See Railroad Accident Report—"Side Collision of Two Missouri Pacific Railroad Company Freight Trains at Glaise Junction, Near Possum Grape, Arkansas, October 3, 1982" (NTSB/RAR-83/06).

With the assistance of the Association of American Railroads and the Railway Labor Executives Association, develop and promulgate a requirement that alcohol/drug abuse involvement accidents/incidents be fully reported to the FRA. (Class II, Priority Action) (R-83-32)

—to the Railway Labor Executives Association:

In conjunction with the Association of American Railroads, assist the Federal Railroad Administration in developing a requirement that timely toxicological tests are performed on all operating employees involved in a railroad accident which involves a fatality, a passenger train, releases of hazardous materials, an injury, or substantial property damage. (Class II, Priority Action) (R-83-33)

In conjunction with the Association of American Railroads, assist the Federal Railroad Administration in developing regulations and procedures to require that alcohol/drug involvement related accidents/incidents be fully reported to the FRA so that a data base can be developed for devising and implementing effective safety countermeasures to eliminate or minimize accidents involving alcohol/drug abuse. (Class II, Priority Action) (R-83-34)

The Safety Board is awaiting specific responses to these recommendations.

In a February 14, 1983, incident at the Washington, D.C. Union Station, an intoxicated engineer was removed from a Maryland Department of Transportation commuter train, operated by the Baltimore and Ohio Railroad (B&O), a few minutes before its departure, after a passenger observed the engineer's condition and reported it to Washington Terminal Company (WTC) officials. Although a toxicological test revealed the engineer had a blood alcohol level of .222 percent, the engineer stated that he believed he was fit and thought he had stopped drinking early enough for the alcohol in his system to "wear off" before he went to work.

As a result of its investigation of the Union Station incident, the Safety Board issued the following recommendations on April 29, 1983:

—to the Baltimore and Ohio Railroad Company:

Increase the level of periodic supervisory road checks on the commuter passenger route between Brunswick, Maryland, and Washington, D.C. (Class II, Priority Action) (R-83-35)

Expand its educational program for operating traincrews to instruct them about the effects of alcohol on performance of duties. (Class II, Priority Action) (R-83-36)

--to the Washington Terminal Company:

Immediately institute supervisory checks of traincrews reporting for duty. (Class II, Priority Action) (R-83-37)

--to the United Transportation Union:

> Actively support the development and implementation of more meaningful alcohol abuse rules and procedures to curb use of alcohol by railroad operating employees during a specific period before they report for duty and while they are on duty. (Class II, Priority Action) (R-83-38)
>
> Disseminate to its local unions the facts and circumstances of the incident that occurred at Union Station in Washington, D.C. on February 14, 1983, and emphasize the dangers posed by alcohol abuse and the means suggested by the United Transportation Union for preventing such incidents. (Class II, Priority Action) (R-83-39)

--to the Brotherhood of Locomotive Engineers:

> Actively support the development and implementation of more meaningful alcohol abuse rules and procedures to curb use of alcohol by railroad operating employees during a specific period before they report for duty or while they are on duty. (Class II, Priority Action) (R-83-40)
>
> Disseminate to its local unions the facts and circumstances of the incident that occurred at the Union Station in Washington, D.C. on February 14, 1983, and emphasize the dangers posed by alcohol and drug abuse and the means suggested by the Brotherhood of Locomotive Engineers for preventing such incidents. (Class II, Priority Action) (R-83-41)

The Safety Board is awaiting responses to these recommendations.

Operation by Unqualified Employee

As she later admitted, the operator-clerk also exercised very poor judgment in agreeing to ride the locomotive with the head-end crewmembers knowing it was against the rules. At Lockhart, the engineer told her to sit in the operator's seat, and when she asked what he wanted her to do, she recalled that he said, "You haven't got to do anything, just blow for the crossings. That is all you got to do. We are all set."

The operator-clerk was not qualified or authorized to operate a locomotive. In her work, she was routinely involved in the operation of trains and she had a working knowledge of the Hammond District. She had been regularly used as an extra yardmaster, and in that job would, from time to time, need to be on locomotives in the yard. She had wanted to become an engineer and had tried to learn how to operate a locomotive whenever the opportunity presented itself. Many railroad supervisors who were not former engineers have learned how to operate a locomotive in just such a manner. However, what the operator-clerk had learned did not adequately prepare her for the emergency brake application at Livingston, and when the application occurred, she did exactly the opposite of what the situation demanded relative to the locomotive brake.

The operator-clerk's first reaction, placing the throttle in the idle position and the automatic brake handle in the emergency position, was exactly as prescribed by ICG's train handling rules. (See appendix C.) But, she also moved the locomotive brake handle from release to the full application position. This was inappropriate, since the proper method of operation is to prevent the locomotive brakes from applying to prevent

rapid deceleration of the forward part of the train. When the engineer got over to the controls, he may have depressed the handle in order to "bail-off" the locomotive brakes. Even if this was done, either before or after the operator-clerk placed the handle in the full application position, there still would have been a full-service application of the locomotive brakes unless the handle was moved back to release position. (See appendix C.) In his impaired condition, the engineer might have failed to immediately recognize the position of the brake handle. The operator-clerk's testimony indicated that the engineer was relatively slow in responding to the emergency brake application, getting to his feet, and coming over to the controls. As demonstrated in the simulations, timing was extremely critical, even in "bailing off" with the handle in release position. Even if the engineer did ultimately place the locomotive brake handle in release position, it is probable that he did not do so soon enough to prevent critical deceleration of the forward part of the train.

Dynamic Forces in the Train

The postaccident simulations confirmed what a trained engineer would understand -- failure to keep the locomotive brake from applying until the brakes on the rest of the train were fully applied, could create buff forces great enough to derail the train. The combination of immediate power loss due to the unit being equipped with power cut-off without time delay and heavy braking apparently decelerated the locomotive and the cars immediately behind it. This action occurred while the slack was still stretched throughout most of the train and before the brakes were fully applied on the rear portion. The derailment configuration clearly indicated that the forces of the still largely unrestrained momentum from the rear caught up with the decelerating forward portion of the train at the two empty gondola cars, the 19th and 20th cars behind the locomotive. In 15 postaccident simulations where compressive buff force reached or exceeded the 240,000 pounds needed to jackknife, maximum force always occurred at or near the location of these cars.

The rearmost of these two gondola cars (EJ&E 4712) could not resist the compressive buff force, nor could it transmit the force forward inasmuch as the slack had already bunched in the cars ahead. Consequently, the rear of the car jackknifed vertically, allowing the immediate vertical separation of the bolster center plates. As indicated by the marks on the car's underside, once the centerplates separated, the rear truck moved forward. This was an indication that the brakes had already been applied on the car. In the horizontal jackknifing that followed, the car struck the corner of the gondola ahead of it and started that car in a horizontal jackknifing configuration of its own. As the two cars moved out of normal east-west alignment, they began destroying the track structure, which caused the derailment of the cars ahead and behind them.

There was no evidence of overheating to indicate there was prolonged contact between the wheels and the underside of gondola EJ&E 4712. In his preliminary report, the ICG's metallurgist contended that heating of the opposing surfaces to 600° F had occurred, but this contention was not supported by subsequent testing of the car wheels. Moreover, evidence was not provided to support his statement that the initial derailment occurred at the joint with the broken bars before the brakes were applied. While there was no question that the center pin of EJ&E 4712's trailing truck had been broken before the date of the accident, it was obvious that the car had been in long-haul service for months or even years in that condition. The male-female fitting of the bolster center plates was designed to prevent the plates from separating under normal service conditions.

Action by ICG Supervision

Following the accident, the engineer managed to avoid contact with other people by staying on the locomotive. When the dispatcher instructed him to flag the highway, the engineer had the operator-clerk do it for him. The head brakeman, however, had to leave the locomotive to go back and uncouple from derailed cars, if necessary, and he did come into contact with two deputy sheriffs and the Livingston fire chief. Although none of these men recalled detecting the smell of alcohol on the brakeman, the fire chief said that the odor of oil smoke was so strong that it was not possible to smell anything else.

Almost 2 hours passed before the first ICG supervisor, the senior trainmaster, arrived at the head end of the train, which was a considerable distance upwind from the derailment area. The operator-clerk stated that as she watched the trainmaster talk to the engineer, she was certain that the engineer would be "fired or even jailed," for she could not understand how anyone could get within 10 feet of him without perceiving his condition. Nevertheless, the trainmaster allowed the crew to proceed to McComb with the remaining forward part of their train, which included a tank car loaded with flammable compressed gas. The trainmaster did not have a supervisor accompany the crew. The transportation superintendent, who said he interviewed the crewmembers at Hammond, did not ask the crewmembers to submit to a toxicological examination. Considering the engineer's record as a habitual rule violator, the superintendent surely should have been alert to the possibility that his condition might be impaired. Moreover, although the transportation superintendent testified that he was not personally acquainted with the engineer and his background, the microwave radio tape indicated that the two men were on a "first name" basis. (See appendix D.) In view of what the engineer admitted he had to drink that morning, and considering the operator-clerk's testimony in that regard, the Safety Board believes that it should have been apparent to the supervisors that the engineer was intoxicated. The supervisors were experienced and should have realized that toxicological examinations, if they turned out to be negative, would have removed all doubt as to whether the engineer and brakeman were intoxicated.

Response to Emergency

The accident impact on the town of Livingston was swift, potentially devastating, and totally unanticipated. Firemen and policemen living in Livingston and the surrounding area were quick to respond. The fire chief quickly recognized that a pressure fire was building in the wreckage and that he did not have the capability to attack it. Instead of jeopardizing the safety of his men in a senseless exercise, he wisely used them to reroute highway traffic and to begin an immediate and rapid evacuation of the residents. Fortunately, most of the town's residents were still at home asleep or getting ready to go to work, the school had not yet opened, and there was little traffic on the streets and roads. Therefore, it was possible to quickly evacuate the residents by canvassing the town on a house-by-house basis. However, Livingston had not been included in the State Police program to develop awareness of evacuation problems that could occur as a result of a hazardous materials train derailment. No contingency plan to cope with such problems had been developed for the town. As pointed out by the mayor, evacuation later in the day would have been far more difficult.

In another part of the town, the mayor quickly set up a command post and directed the police to begin evacuation on the basis of information the train conductor was able to give him, which was not much more than the identification of the commodities which were in the derailment, as shown on the waybills. Neither the waybills nor the one-line consist the conductor had been given included any response information. The conductor

had left the hazardous materials guidebook locked up in the caboose. Even though the guidebook was obsolete and lacked the "UN" commodity code numbers that appeared on the waybills and the car placards, it did include response information for many of the hazardous materials in the derailment. Fortunately, an off-duty Louisiana State Police officer came to Livingston and had with him an up-to-date guidebook with both "UN" numbers and appropriate response information. As a result, personnel at the command post were able to obtain fairly accurate information on the characteristics and dangers of the chemicals in the derailment.

The Louisiana State Police, which undertook overall management and coordination of the response, site access and surveillance, area evacuation, and communications, displayed great professionalism and competence throughout the emergency. The quality of the State Police response, as well as that of Livingston's mayor, sheriff, firemen, and police, was largely responsible for the absence of casualties during the emergency.

The Louisiana Department of Natural Resources has effectively directed the effort to contain and remove chemical pollution resulting from the derailment. In the long term, the principal problem has been perchloroethylene, a nonregulated chemical which is nondegradable and may have nonreversible toxic effects in humans. Excavation of contaminated soil may continue to midyear 1983 and beyond, with continuing impact on the community and the railroad.

The manufacturer and shipper of the perchloroethylene which was released at the derailment site had representatives assisting the Louisiana State Police in their response to the emergency. Nearly 2 weeks passed, however, before cleanup crews began clearing the wreckage. Nevertheless, a considerable amount of perchloroethylene- contaminated soil was moved around the derailment site before the chemical's potential toxicity, its ability to move rapidly through soil strata, and its resistance to thermal, chemical, and biological action were understood and efforts were undertaken to contain its further migration. Perchloroethylene is not a new product, and its characteristics and toxicity should have been understood by the manufacturer and EPA; yet perchloroethylene has never been classified as hazardous by MTB. Apparently, such action on the part of MTB will only follow proposed rulemaking on the part of EPA, which could be as much as a year away. Although the perchloroethylene spill at Livingston has become the most serious result of the derailment from the standpoint of long-term environmental and potential public health impact, MTB has neither classified the chemical as hazardous nor notified the transporters of its properties and potential public health hazard.

The Safety Board believes that unfortunately perchloroethylene is only one of many chemicals which are not regulated and the release of which may pose serious public health considerations. On the basis of what has been learned at Livingston, there should be no further delay on the part of MTB in classifying perchloroethylene as hazardous and requiring its transportation in tank cars which have tank head protection and do not have vulnerably exposed bottom outlets. Other chemicals which pose a hazard to public health also should be identified and regulated without delay.

The need for MTB to respond to the lessons of the Livingston accident and to take appropriate action is evidenced by a second perchloroethylene spill in Louisiana. On April 20, 1983, a bottom outlet extension on a tank car containing the chemical was damaged as the car was moving in a Southern Pacific Transportation Company (SP) train through the city of Lake Charles. Approximately 8,000 gallons of the chemical was

released before the leak could be contained. Although the SP personnel immediately involved knew nothing of the toxicity of perchloroethylene, they did notify the shipper and the Louisiana Department of Natural Resources. Dikes were built to contain the spill, but in 3 days the chemical had penetrated to a depth of 11 feet. As a result, DNR has ordered excavation of the contaminated soil as it did at Livingston.

Tank Car Identification

Although emergency response personnel knew what hazardous materials were involved in the derailment, their exact location in the wreckage was not known. Many tank car placards were torn off in the derailment. Car numbers and placards that were still in place were often obscured by fire, smoke, and wreckage. Despite close-in videotaped aerial and ground surveillance by the State Police, the exact location of several potentially dangerous cars could not be determined for 2 1/2 days. These cars were close to two covered hopper cars filled with burning plastic pellets that were generating the most intensive fire and heat radiation in the wreckage. Had it been possible to quickly identify the car loaded with metallic sodium, which was highly reactive to water, the pellet fire might have been attacked to reduce the fire and heat impingement on the vinyl chloride cars.

For many years, tank cars used to transport hydrocyanic acid, one of the more hazardous commodities shipped by rail, have had a special color scheme - red stripes on the otherwise all-white tank. This idea, adopted by the chemical industry to make these cars particularly easy to identify in car handling, train placement, and derailment situations, has been eminently successful. The identification problems encountered at Livingston, and at an earlier hazardous materials derailment at Colonial Heights, Virginia, 26/ suggest that the chemical industry should give serious consideration to expanding the color-coding idea to other highly-dangerous commodities. According to the Association of American Railroads, more than 75 percent of tank cars used to transport hazardous materials are dedicated to single-commodity service. Thus, in the transportation of many hazardous materials, unique color coding would be no less practicable than has proven to be the case with hydrocyanic acid.

In response to the suggestion that the color-coding principle be expanded to include other hazardous materials, the Chemical Manufacturers Association (CMA) pointed out that there are hundreds of hazardous chemicals shipped in tank cars and that expansion of color coding might be unworkable. This would be particularly true, according to CMA, if coding was done on a generic basis because of the varying response actions required for individual chemicals within a generic classification. CMA also saw potential difficulties with color coding for specific chemicals since a large number of color combinations would be required and the fact that not all tank cars are dedicated to hauling a specific commodity. Nevertheless, the Safety Board believes that the car identification problems experienced at Livingston indicates that the merits of extending color-coding identification of tank cars to particularly high-risk commodities should be closely examined and that CMA has the capability to undertake the task.

26/ See National Transportation Safety Board Railroad Accident Report, "Derailment of Seaboard Coast Line Railroad Train No. 120, Colonial Heights, Virginia, May 31, 1982" (NTSB-RAR-83-4).

Tank Car Performance

Although the wreckage configuration suggested that extraordinary dynamic forces were present during the derailment, there was no instance of an overriding coupler puncturing a tank head. All eight of the critical Class 105 and 112 pressure cars had shelf couplers, and it was evident that no vertical coupler separation occurred while these cars were still in line. A block of 20 Class 111 tank cars at the rear of the derailment included 12 without shelf couplers, 5 of which were at the head of the block. Head shields on some of these cars prevented coupler-inflicted punctures, but the cars with conventional couplers appeared to have been easily separated from each other and had far more lateral movement than the cars ahead which had shelf couplers. As a result, most of the cars in the rear block received crushing shell and head strikes from the heads, couplers, and stub sills of following cars. Even jacket-insulated cars in this group were breached. Only three cars at the extreme rear of this block stayed in line and did not lose all or most of their contents.

The Livingston derailment paralleled earlier experience insofar as the performance of shelf couplers is concerned. It also confirmed the Safety Board's observation following a special investigation of tank car performance in a 1979 derailment near Paxton, Texas, 27/ that when tank cars are not vertically restrained by shelf couplers, their performance becomes difficult to predict. What happened to such cars at Livingston strongly suggests that had they been equipped with shelf couplers, they would have sustained fewer punctures and breaches. During the Safety Board's public hearing, the director of the joint Rail Progress Institute (RPI) - Association of American Railroads (AAR) Tank Car Project testified that the conversion to shelf couplers on tank cars has proven to be unquestionably cost-effective. Nevertheless, a relatively large number of unequipped tank cars continue to be in service carrying hazardous materials. While the tank car owners are not required by Federal regulation to complete the shelf coupler retrofit until 1985, the success of the protection in this and other accidents suggests that the voluntary acceleration of the retrofit program would significantly improve overall tank car performance in future derailments.

Out of 22 tank cars equipped with bottom outlet extensions, 15 had the extensions damaged, and of these, 7 lost part or all of their contents as a result. Only 9 of the cars had the partly-recessed "low profile" extensions and/or skids protecting the bottom outlet. Two cars with "low profile" extensions and the car with a skid lost their contents through damaged extensions. In the 1980 tank car performance study, 28/ the Safety Board recommended to the Department of Transportation (DOT) that some form of effective bottom outlet protection be required, but DOT has never acted on the recommendation. The experience at Livingston suggests that partial recessing and skids are only partly effective in preventing product loss through damaged bottom outlets. The Safety Board believes that this remains a serious problem and that, perhaps, the elimination of the outlets or total recessing remain as the only effective means of dealing with the problem.

Performance of the thermal tank insulation on the eight pressure cars in preventing superheating of the gases they contained greatly exceeded the required 100 minutes in an all-enveloping fire and 30 minutes in a torch fire. However, it was noted that there appeared to be a significant difference between the jacketed cars and the thermally-coated cars in their ability to resist mechanical forces during the derailment sequence.

27/ See Special Investigation Report--"The Accident Performance of Tank Car Safeguards" (NTSB-HZM-80-1).
28/ Ibid.

Although heavily damaged, the outer jackets provided enough protection to prevent puncture of the shells of the five jacketed pressure cars. However, two of the three nonjacketed Class 112T thermally-coated cars were punctured in the derailment.

ICG's Training, Oversight, and Rehiring Practices

As part of its training program, ICG offers courses in elements of train dynamics and hazardous materials to its employees. The engineer had taken courses in both fields. Although they worked on the part of the ICG system with the highest concentration of hazardous materials traffic, neither the general yardmaster nor the conductor had received such training, probably because it was not mandatory. Had he known more about train dynamics, the general yardmaster might have put together an Extra 9629 East that was less vulnerable to internal compressive forces. The conductor might have been more concerned about the way his train was being operated had he been given a better understanding of some of the commodities in his train.

The last major accident on the ICG preceding the Livingston derailment was an Amtrak passenger train derailment at Springfield, Illinois, on October 30, 1980. 29/ In its report of that accident, the Safety Board cited the many major train accidents which had occurred on the ICG since 1969. It noted that there were recurrent findings of inadequacies in ICG's training and safety programs, which led to the conclusion that safety was not being given sufficient emphasis in all aspects of the railroad's operations. The Safety Board found that the same fundamental weakness in ICG's approach to safety was still evident and was a contributing factor in the Springfield accident. Although ICG responded that it had intensified its efforts to achieve greater rules compliance, the Livingston accident is another indication that ICG has yet to significantly modify its programs to achieve safer train operations systemwide. The testimony of ICG's vice president of operations left little doubt that management still equates safety largely with the reduction of employee personal injuries. While preventing reportable injuries is important work, and while not a single employee injury resulted from the Livingston derailment, it should be noted that no rail accident has occurred in recent years which had greater economic impact or potential for tragedy.

The ICG division involved in this accident had a safety supervisor with a broad background in train operations, yet he had very few responsibilities relevant to train operations safety, or operating rules training and enforcement. The trainmaster who had direct responsibility for the safety of Extra 9629 East, its crew, and operations at Baton Rouge and over the Hammond District was preoccupied on the night of the accident with an injured employee. Although he testified that he tried to be on hand at least once a night when a crew reported for duty, the operator-clerk stated that it was rare to see a supervisor on the graveyard shift at Baton Rouge. She said that she worked 75 percent of her duty tours on that shift at Baton Rouge and that she worked where the crews reported, just a few feet from the trainmaster's office. The trainmaster recalled that he had last ridden a train over the Hammond District about 6 months before the accident.

The three most recent major accidents on the ICG system all occurred at night and involved employee failures. According to the transportation superintendent, operations are conducted 24 hours a day with about as many trains being operated at night as are

29/ See Railroad Accident Report, "Derailment of Amtrak Passenger Train No. 21 on the Illinois Central Gulf Railroad, Springfield, Illinois, October 30, 1980" (NTSB-RAR-81-5).

operated during the day. The transportation superintendent had a large force of operating supervisors, but only a few had assigned hours at night. This inequity between nighttime and daylight supervision is by no means peculiar to ICG. Many railroads are unable to effectively supervise nighttime operations because few supervisors work at night. In its 1980 report of a collision involving a train being operated by a conductor who was under the influence of marijuana, 30/ the Safety Board said:

> As with numerous recent train accidents investigated by the Safety Board, the crewmembers. . . .reported for duty at night, and there was no supervisor working at the reporting point at night. Similarly, it does not appear that. . . .supervisors ride with crews or board trains enroute with any regularity. Crewmembers are not going to be concerned about their own fitness, much less the fitness of the men they work with when there is little probability that they will encounter a supervisor where they report for work, or on the job. As long as mainline operations are conducted 24 hours a day, supervision of train crews should be provided on a 24-hour basis. No supervisory program of testing for rules compliance can be effective if it is conducted on a part-time basis.

Although the engineer had a history of violating rules and restrictions, division-level management repeatedly restored the engineer to duty and allowed him to stay on a job in which his performance could impact seriously on other persons. The decision to restore an employee to a position of trust and responsibility after he has been discharged for serious rules infractions should be entrusted only to management above the division level. This seems particularly vital in the case of employees who are given the responsibility for operating trains and who are normally subject to only minimal supervision. The Safety Board believes that it is an unacceptable risk to other employees and the public to permit an employee with serious deficiencies, such as the engineer of Extra 9629 East, to operate trains carrying hazardous materials or passengers.

The responsibility for monitoring the engineer's performance was left to the line supervisors, not all of whom might have been familiar with his past performance. Insofar as violations of Rule G are concerned, it is probable that such supervisors will not be on the lookout for them and may even look the other way as long as submission to a toxicological examination remains voluntary. Line supervisors, who are primarily concerned with the expeditious movement of trains, are not likely to enforce this important rule in marginal cases where it is virtually impossible for them to obtain the hard evidence they need. This accident again demonstrated that there is very little likelihood that crewmembers can or will exercise their responsibility to prevent an impaired fellow crewman from going to work. The conductor was nominally in charge of the crew, yet he never was in actual contact with the engineer at any time prior to the accident.

"Good Samaritan" Legislation

Although Louisiana has no "Good Samaritan" law to protect individuals and companies who voluntarily provide assistance in a hazardous materials emergency, chemical company response teams provided timely and invaluable technical assistance throughout the Livingston emergency. In this instance, the companies probably decided to

30/ See Railroad Accident Report, "Rear-end Collision of Consolidated Rail Corporation Freight Trains ALPG-2 and APJ-2 near Royersford, Pennsylvania, October 1, 1979" (NTSB-RAR-80-2).

participate because of their close proximity to the derailment location and because the State's emergency coordinator assumed full responsibility for decisions that were made. The Safety Board is concerned that growing fear of claims will increasingly discourage timely assistance by those familiar with hazardous materials properties in accidents that occur where "Good Samaritan" laws do not exist. The transporters who have the responsibility for dealing with the commodities in an accident must necessarily rely on voluntary expert assistance. During the Safety Board's public hearing, the Chemical Manufacturers Association introduced as an exhibit proposed model legislation (see appendix F) which would provide uniform protection in all States to those who voluntarily assist in hazardous materials emergencies. The proposed liability protection does not extend to persons under hire or to instances where gross negligence or intentional misconduct are involved. While the Safety Board does not necessarily endorse the model legislation, it believes that a dialogue between the chemical companies and the States should be undertaken in an effort to establish the need for equitable and uniform legislative protection.

CONCLUSIONS

Findings

1. Since Extra 9629 East included a large number of hazardous materials tank cars, the train should have received thoughtful and expert makeup, inspection, and handling.

2. Two pairs of empty cars were placed near the head end of the train where they were extremely vulnerable to buff force, inspite of the fact that a minimum amount of switching would have been required to relocate these cars to safer locations in the train.

3. The general yardmaster at Baton Rouge supervised the makeup of Extra 9629 East. He was not required to determine that the train's profile was safe, nor had he received training in train dynamics which many other Illinois Central Gulf employees had been provided.

4. The trailing locomotive unit of Extra 9629 East lacked a holding bracket for the front end air hose. As a result, the air hose coupling was damaged by contact with the track and was battered and worn to the point that it would uncouple from the air hose of the head car of the train whenever subjected to severe vertical lift or force.

5. Although the locomotive assigned to Extra 9629 East was inspected at the Baton Rouge diesel shop, neither the missing bracket nor the air hose with the worn coupling was replaced.

6. There were a number of "pumping" joints in the jointed track section at Livingston, which were a chronic problem, often resulting in cracked or broken joint bars.

7. Although Illinois Central Gulf trackmen inspected the Hammond District track four times weekly, they did not discover fatigue cracks in the joint bars at the derailment location.

8. As a result of his drinking, the engineer had an estimated blood alcohol level of about .19 percent at the time of the accident, and his ability to function as an engineer was impaired significantly.

9. The head brakeman had been drinking with the engineer while they were off duty and reportedly also took a drink on the train. However, he had considerably less to drink and was less functionally impaired than the engineer.

10. The conductor had no face-to-face contact with the engineer and head brakeman after they arrived at Baton Rouge on the evening of September 27. He failed to discuss the train orders with the engineer and did not inform him of the location of placarded cars in their train, as required. The general yardmaster was briefly in contact with the engineer but said he perceived nothing wrong with the engineer's condition.

11. When Extra 9629 East reached the Lockhart defective equipment detector, about 10 miles from Livingston, the engineer turned the operation of the locomotive over to an off-duty Illinois Central Gulf operator-clerk whom he had invited to ride on the locomotive at Baton Rouge, both actions being in violation of the rules. While the operator-clerk had not consumed any intoxicants, she was not qualified to operate the locomotive.

12. Although the dispatcher knew that Extra 9629 East reached the Lockhart detector about 20 minutes sooner than it should have, he took no exception and made no effort to contact the traincrew.

13. Although the conductor was in charge of the train and was responsible for its safety, and although he should have known that the train's speed for the return run from Baton Rouge was in excess of that authorized, he made no effort to caution the engineer about the train's speed.

14. The operator-clerk was at the locomotive's controls when the train went into emergency braking at Livingston. At the time, the train was probably moving at a speed of about 40 to 45 mph, or 5 to 10 mph greater than was permitted.

15. The worn air hose coupling on the trailing locomotive unit became uncoupled while the train was moving over jointed track at Baton Rouge before the accident and at Livingston after the accident. Based on this and the testimony of the operator-clerk, the air hose coupling probably became uncoupled at the defective joint and caused the train to go into emergency braking.

16. When the brakes went into emergency, the operator-clerk incorrectly placed the locomotive brake handle in the full application position. When the engineer came over to the operator's side, he may have "bailed off" the locomotive brakes by depressing the handle. But in his impaired state, he probably did not realize that the brake had been applied manually.

17. As a result of the immediate reduction of locomotive power due to the action of the power control switch and the failure to prevent the locomotive brakes from applying, severe buff force sufficient to jackknife and derail the train occurred in the vicinity of the empty gondola cars in the forward part of the train.

18. The rearmost of these gondolas, EJ&E 4712, first jackknifed vertically, separating the rear truck bolster center plates. With its car body off center, the gondola went into a horizontal jackknifing sequence, derailed, and caused the derailment of the gondola ahead of it. The general derailment followed as a result of track damage caused by the gondola cars.

19. Shortly after the derailment, escaping vinyl chloride gas ignited and the resultant blast and fireball damaged nearby buildings and started fires in the wreckage. Although the Livingston fire department responded quickly to the emergency, the fire chief recognized that he did not have the equipment to attack the burning vinyl chloride cars and he elected instead to begin evacuating the town. Coupled with similar action on the part of the town's mayor, this decision probably prevented injuries to firemen and residents of the town.

20. Since the conductor had not been given an expanded "9-line" consist list and he had left the hazardous materials guidebook in the caboose, he was unable to provide the pertinent emergency response information for the various chemicals that were in the derailment.

21. Difficulty in identifying potentially dangerous cars and their locations in the wreckage materially delayed attacking the principal source of fire and intense heat. As a result, this source continued to superheat two cars which ultimately exploded and rocketed. These incidents materially added to the damage to property.

22. Tank head protection in the form of shelf couplers and head shields was effective in preventing coupler-inflicted head punctures. However, the lack of shelf couplers on many tank cars in the rear half of the derailment permitted wide lateral divergence of these cars and consequent strikes from following cars. As a result, much of the contents of these cars was spilled.

23. Adding to the spillage of chemicals from derailed cars was damage to bottom outlets of a number of cars. Partial recessing of outlets and/or skid protection on some of these cars did not appear to effectively prevent bottom outlet damage.

24. The jacketed insulation on the eight cars loaded with commodities under pressure greatly exceeded the required retardation of overheating in all-enveloping and torch fire situations. However, the coated insulation on the retrofitted Department of Transportation 112T cars was inferior to the jacketed insulation in resisting mechanical damage in the derailment sequence.

25. According to the operator-clerk, about 35 minutes after the accidents, the engineer was unable to properly repeat a simple train order, although the operator-clerk wrote it down for him and coached him as he attempted to repeat it. The engineer never relayed the contents of the order to the conductor, as was required.

26. The trainmaster, the transportation superintendent, and another trainmaster who interviewed the crew en route did not request that the crewmembers submit to toxicological examinations.

27. The engineer had a long record of violating rules and restrictions. He had been disciplined in the past for infractions similar to those on the night of the accident. He had been frequently dismissed or suspended only to be reinstated on a leniency basis. He was never restricted from road service, and the records did not indicate that he was given any special training or attention.

28. The Illinois Central Gulf had 35 line transportation supervisors assigned to the division involved in this accident, and train operations were as frequent at night as they were during the day, but only a few of these supervisors had regularly assigned hours at night.

29. Although the night trainmaster at Baton Rouge was on duty, he had no contact with the crew of Extra 9629 East on the night of the accident. He was, for much of the night, at a local hospital with an injured employee. He did not regularly ride with traincrews on the Hammond District, although this was part of his assigned territory.

30. The principal thrust of the Illinois Central Gulf's safety program appears to be the prevention of reportable employee injuries. At least on the division involved in this accident, the Illinois Central Gulf Safety Department did not become involved in train operations safety, operating rules training, and operational efficiency checks.

31. Because of timely action by Livingston's mayor and fire chief, rapid evacuation of the town was completed in a relatively short time without complications. However, as no contingency evacuation plan had been formulated, an evacuation later in the day might have encountered serious difficulties and would have taken much longer.

32. The State of Louisiana should encourage and assist small communities with hazardous materials train exposure similar to Livingston's to prepare adequate contingency plans for evacuation.

33. The Louisiana State Police effectively coordinated the overall response to the emergency and were instrumental in securing the timely assistance of response teams from the area's chemical companies.

34. The principal long-term problem to the community and the railroad has been large-scale absorption of the toxic chemical perchloroethylene into the soil. This resulted partly from delayed recognition of the chemical's toxicity and the movement of contaminated soil over a large area during wrecking and clearing operations.

35. Since it was necessary to delay wrecking and clearing operations significantly, there was adequate time to recognize the toxicity of perchloroethylene. This was particularly so inasmuch as experts from the company which manufactured the chemical were on hand during this period.

36. The Department of Transportation's Materials Transportation Bureau has never classified perchloroethylene as a hazardous commodity and has never required that it be shipped in tank cars that have tank head or bottom outlet protection.

37. The Materials Transportation Bureau needs to identify commodities such as perchloroethylene which may pose a significant long-term threat to local environments, and to regulate their transportation accordingly.

38. The lack of "Good Samaritan" legislation in Louisiana and many other States has lead to reluctance on the part of chemical companies to render timely and urgently-needed technical assistance in hazardous materials emergencies. The need for some form of uniform protection under the law to assure that such assistance will be forthcoming in future emergencies should be studied.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was (1) the disengagement of a worn air hose coupling when the train passed over a low track joint which initiated an emergency application of the train brakes, (2) an excessive buff force within the train resulting from the failure of the person at the locomotive controls to respond properly to the brake application, and (3) the placement of empty cars near the head of the train between heavily loaded cars. Contributing to the cause of the accident were the impairment of the engineer's faculties by alcohol and his abandonment of the locomotive controls to an unauthorized and unqualified person, and the failure of Illinois Central Gulf to supervise train operations and operating personnel adequately, as well as to inspect and to maintain adequately its Hammond District main track. Contributing to the contamination of the environment was tank damage resulting from the lack of shelf couplers on some tank cars and the inadequately protected bottom outlet valves on a number of other tank cars.

RECOMMENDATIONS

Based on its investigation of this accident and others, the National Transportation Safety Board on March 7, 1983, made the following recommendations to the Association of American Railroads:

> In conjunction with the Railway Labor Executives Association, assist the Federal Railroad Administration in developing a requirement that timely toxicological tests are performed on all operating employees involved in a railroad accident which involves a fatality, a passenger train, releases of hazardous materials, an injury, or substantial property damage. (Class II, Priority Action) (R-83-28)
>
> In conjunction with the Railway Labor Executives Association, assist the Federal Railroad Administration in developing regulations and procedures to require that alcohol/drug involvement related accidents/incidents be fully reported to the FRA so that a data base can be developed for devising and implementing effective safety countermeasures to eliminate or minimize accidents involving alcohol/drug abuse. (Class II, Priority Action) (R-83-29)

--to the Federal Railroad Administration:

> Immediately promulgate a specific regulation with appropriate penalties prohibiting the use of alcohol and drugs by employees for a specified period before reporting for duty and while on duty. (Class II, Priority Action) (R-83-30)

With the assistance of the Association of American Railroads and the Railway Labor Executives Association, develop and promulgate effective procedures to ensure that timely toxicological tests are performed on all employees responsible for the operation of the train after a railroad accident which involves a fatality, a passenger train, releases of hazardous materials, an injury, or substantial property damage. (Class II, Priority Action) (R-83-31)

With the assistance of the Association of American Railroads and the Railway Labor Executives Association, develop and promulgate a requirement that alcohol/drug abuse involvement accidents/incidents be fully reported to the FRA. (Class II, Priority Action) (R-83-32)

--to the Railway Labor Executives Association:

In conjunction with the Association of American Railroads, assist the Federal Railroad Administration in developing a requirement that timely toxicological tests are performed on all operating employees involved in a railroad accident which involves a fatality, a passenger train, releases of hazardous materials, an injury, or substantial property damage. (Class II, Priority Action) (R-83-33)

In conjunction with the Association of American Railroads, assist the Federal Railroad Administration in developing regulations and procedures to require that alcohol/drug involvement related accidents/incidents be fully reported to the FRA so that a data base can be developed for devising and implementing effective safety countermeasures to eliminate or minimize accidents involving alcohol/drug abuse. (Class II, Priority Action) (R-83-34)

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

--to the Illinois Central Gulf Railroad:

Provide intensive supervision of night train operations and include in its precribed supervisory efficiency checks, periodic unannounced checks of train crewmembers' fitness for duty at reporting points and on trains en route. (Class II, Priority Action) (R-83-83)

Improve locomotive inspection procedures at the Baton Rouge diesel facility. (Class II, Priority Action) (R-83-84)

Provide all employees who are involved in the makeup, handling, and operation of hazardous materials trains thorough training in emergency response to hazardous materials incidents and train dynamics. (Class II, Priority Action) (R-83-85)

Include in its hazardous materials and operating rules training curricula thorough reviews and explanations of the timetable special instructions pertaining to the handling of hazardous materials incidents and providing local emergency forces with accurate response information. (Class II, Priority Action) (R-83-86)

Provide the conductors and engineers of all trains which include hazardous materials cars with current and complete emergency response information for each hazardous material carried in their train. (Class I, Urgent Action) (R-83-87)

Before reopening the Hammond District to the through operation of trains containing hazardous materials, improve roadbed conditions to provide adequate vertical support at track joints and replace all track joint bars which give evidence of fatigue cracking. (Class II, Priority Action) (R-83-88)

Require that the rehiring of train service employees who are discharged for serious infractions of the operating rules and restoring them to train service be approved by management above the division level. (Class II, Priority Action) (R-83-89)

--to the Research and Special Programs Administration:

Require the Materials Transportation Bureau to identify commodities such as perchloroethylene which may pose a serious long-term threat to local environments, and to take timely action to regulate their transportation. (Class I, Urgent Action) (R-83-90)

--to the State of Louisiana:

Expand the Louisiana State Police "Hazardous Materials Awareness Program" to focus on rural communities, which have schools, business districts, residential areas, or highways in close proximity to railroad lines used to transport hazardous materials. (Class II, Priority Action) (R-83-91)

--to the Chemical Manufacturers Association:

Extend the use of color coding of tank cars or adopt some other effective means of identifying high-risk commodity tank cars in switching operations and in wreck clearing operations. (Class II, Priority Action) (R-83-92)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ G. H. PATRICK BURSLEY
Member

/s/ DONALD D. ENGEN
Member

August 10, 1983

APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

Investigation

The National Transportation Safety Board was notified of the accident about 8:30 a.m., on September 28, 1982. The Safety Board immediately dispatched an investigator from the Fort Worth Field Office and the investigator-in-charge from Colorado. Additional members of the investigative team were subsequently dispatched to the scene from Washington, D.C. Investigative groups were established for operations and human factors, vehicle factors, track, and hazardous materials.

Hearing

The Safety Board convened a 3-day public hearing as part of its investigation of this accident on November 15, 1982, at Baton Rouge, Louisiana. Parties to the hearing included the Illinois Central Gulf Railroad, the State of Louisiana, the Town of Livingston, Louisiana, the Federal Railroad Administration, the Association of American Railroads, the Chemical Manufacturers Association, the Brotherhood of Locomotive Engineers, and the United Transportation Union. The hearing was reopened and additional testimony was taken at Washington, D.C., on December 9, 1982. Testimony was taken from 30 witnesses and 58 exhibits were accepted into the record.

APPENDIX B

TRAIN PERSONNEL INFORMATION

Conductor Ira Lee Robinson

Conductor Ira L. Robinson, 59, was employed as a brakeman by the Illinois Central Railroad (IC) on October 21, 1941. After 2 years of wartime service in the Army Air Corps, he was requalified as a brakeman on January 8, 1945. Mr. Robinson was promoted to conductor on December 14, 1953, and at the time of the accident was regularly assigned in that capacity to trains MG-5 and GS-2 operating between McComb, Mississippi, and Baton Rouge, Louisiana. According to his record, Mr. Robinson last passed a company physical examination on March 27, 1979, at which time he was required to wear corrective eyeglasses at all times while on duty. Although the service record indicates he had not been examined on the operating rules since he was promoted in 1953, Mr. Robinson testified that he had attended such a class during 1982. During his IC and ICG 31/ service, Mr. Robinson had reported having been injured on duty 20 times, and on this basis, he was discharged as an unsafe employee on June 4, 1968. He was reinstated on a leniency basis. During 1978, he was twice formally cautioned for rules violations—once for improper placement of a hazardous materials car in his train, and once for the operation of his train at a speed of 15 mph through a 10-mph restriction. Subsequent to the derailment at Livingston, he was dismissed from ICG service for failing to exercise his responsibilities in connection with the operation of Extra 9629 East.

Engineer Edward Peyton Robertson, Jr.

Engineer Edward Peyton Robertson, 42, was employed by the Illinois Central Railroad as a brakeman/yardman at McComb, Mississippi, on December 11, 1969. He was transferred to the position of fireman on November 20, 1972, and entered ICG's accelerated engineer's training program 7 days later. This program ran about one-half of the normal term for engineers' training and consisted for the most part of on-the-job training. After passing machinery, airbrake, and operating rules examinations, Mr. Robertson was promoted to engineer on May 16, 1973. According to his service record, he last passed a company physical examination on March 25, 1981. Mr. Roberston last attended an operating rules class on May 3, 1982, and he had attended 1-day train handling classes utilizing the ICG's train dynamics analyzer on September 22, 1980, and February 21, 1981. Mr. Robertson had attended a hazardous materials class which included instruction on related train handling procedures on January 22, 1979. At the time of the accident, Mr. Robertston was assigned to the McComb engineer's extra board.

Mr. Robertson's application for employment stated that he was a high-school graduate, that he had attended college for 3 years, and that he was a graduate of a hospital X-ray technology course. He gave his average weekly consumption of alcoholic stimulants as, "6-pack (maybe)." According to the testimony of Janet Byrd, Mr. Robertson had owned and operated a tavern in McComb which catered to railroad employees during his tenure as an ICG engineer, and that during the 3 to 4 years she had known him, Robertson was a heavy drinker. As far as is known, he had never entered ICG's alcohol rehabilitation program or any progam of a similar nature.

31/ Illinois Central Railroad became Illinois Central Gulf Railroad as a result of its 1972 merger with the Gulf, Mobile and Ohio Railroad.

Prior to entering the ICG engineer's training program, Mr. Robertson's record was clear of disciplinary action. However, before completing the program, he was reprimanded for speeding on February 21, 1973. On November 11, 1974, while laying over between runs at New Orleans, he was arrested and jailed for criminal mischief and disturbing the peace in a Metairie, Louisiana tavern. Although the police did not charge Mr. Robertson with intoxication, its investigative report stated he had consumed four drinks during the 30 minutes he was in the tavern. At the time, he was subject to call to duty and he was dismissed for violation of ICG Rules G, H, and P. (See appendix C.) On February 10, 1975, Mr. Robertson was restored to ICG service on a leniency basis. He was reprimanded for his failure to stop his train short of a "stop" signal aspect on June 25, 1976. However, no entry of this occurrence was made in Mr. Robertson's service record. On June 25, 1977, he was suspended for 45 days for having allowed an unqualified crewmember to operate his locomotive resulting in a side collision. On the first day he worked following the suspension, he was observed in violation of an operating rule and two safety rules. Neither the incident nor the formal reprimand issued to him was noted in his service record. The same was true of an October 10, 1977, reprimand for failure to properly inspect his locomotive. During 1979, Mr. Robertson was suspended three times for an aggregate of 67 days and placed on a year's probation for running past a stop signal and flag protection, for running through a main track crossover switch, and for failure to report for his assignment and engaging in nonrailroad business (his tavern). He was dismissed October 5, 1979, for again failing to report for his assignment. On January 2, 1980, Mr. Robertson was again restored to unrestricted ICG service as an engineer on a leniency basis. His service record indicates that this reinstatement was initiated at the division level by the assistant superintendent. On January 19, 1981, Robertson failed to respond to a hand signal causing a collision between his locomotive and another. Upon admitting responsibility, he was suspended for 10 days. A 21-day suspension followed his being observed violating a speed restriction on the Hammond District on April 8, 1982, and he was reprimanded for failure to report for his assignment on June 22, 1982. Following the Livingston derailment, he was discharged after being charged with consuming alcoholic beverages prior to reporting for duty, possession and use of an intoxicant while on duty, operating and permitting the operation of his train at excessive speed, allowing an unauthorized person to ride and operate an engine, and making false statements and concealing facts.

Rear Brakeman William Edward Coumbe

Rear Brakeman William Edward Coumbe, 38, was employed as a brakeman by the Illinois Central Railroad on January 1, 1963. He was promoted to conductor on or about February 22, 1972, but relinquished his rights as such on October 25, 1978. At the time of the accident, Mr. Coumbe was regularly assigned as rear brakeman to trains MG-5 and GS-2.

For about 10 years prior to the accident, Mr. Coumbe worked irregularly on the ICG, frequently laying off duty and being granted extended leaves of absence for illness (essential hypertension). The longest of these, from October 15, 1977 to October 3, 1978, culminated in his being briefly disqualified on a medical basis. During 1979, 1980, and 1981, he was granted extended leaves for illness beginning each year at the end of July or the beginning of August. According to his service record, he was last examined and found to be physically qualified for duty on September 21, 1981. During his tenure with ICG, Mr. Coumbe was reprimanded on four occasions for minor rules infractions. He was dismissed following the Livingston derailment.

Head Brakeman James Russell Reeves

Head Brakeman James Russell Reeves, 31, was employed as a brakeman by the Illinois Central Railroad on November 11, 1969, and was promoted to conductor on July 1, 1973. According to his service record, he was last examined on the operating rules on May 4, 1982, and attended a hazardous materials class on January 22, 1979.

At the time he went to work as a brakeman, Mr. Reeves had no sight impairment, but after serving in the U.S. Army Transportation Corps during 1971-1972, the railroad requalified him for service with the provision that he had to wear corrective eyeglasses. On October 17, 1974, a company physical examination detected the mood-altering drug Methadone in his urine. According to the examining physician's report, it was also noted that Reeve's left eye was turned inward with a "medial squint," and the opinion was given that this visual defect "alone would probably disqualify a brakeman." On the basis of this examination, Mr. Reeves was disqualified by the ICG's chief medical officer on October 25, 1974. On November 7, 1974, he was dismissed for his use of drugs under ICG Rule G. (See appendix C.) Subseqent negative screenings for drug traces resulted in Reeves being physically requalified on February 14, 1975, and he was reinstated as a brakeman 10 days later.

On October 7, 1974, Mr. Reeves was arrested in Mississippi and charged with three counts of selling narcotics to undercover agents. He was indicted on the three counts on March 19, 1975, and pleaded guilty to them at trial on April 1, 1975. Mr. Reeves was sentenced to 6 years in the state penitentiary on each count with the sentence suspended in lieu of 5 years probation and a fine. ICG dismissed Reeves on the basis of the drug conviction on April 18, 1975, but he was rehired on a leniency basis on June 10, 1976.

Following his reinstatement, Mr. Reeves passed special physical examinations ordered by the ICG chief medical officer on October 29, 1977, and December 21, 1977. He last passed a company physical on January 10, 1979, according to his service record. Aside from the two dismissals, Mr. Reeves' record shows only a 5-day suspension in December 1977 for his failure to report his knowledge of an injury to another employee. He was dismissed by the ICG for failing to exercise his responsibilities in connection with the operation of Extra 9629 East.

Operator-Clerk Janet Hoyt Byrd

Operator-Clerk Janet Hoyt Byrd, 34, was employed by the Illinois Central Gulf Railroad as a clerk on May 5, 1979. According to her service record, she last passed a company physical on April 8, 1980, and on August 26, 1982, she was examined and qualified on ICG operating rules. On February 10, 1982, she was dismissed by ICG for being absent without authority and for failure to report for her assignments. Ms. Byrd was reinstated July 10, 1982, and was dismissed following the derailment at Livingston.

According to Ms. Byrd, she had been a legal secretary and was a paralegal prior to working for ICG. She stated she had been employed by ICG in several operating department clerical positions and at the time of the accident was assigned to the clerical extra board for Geismar and Baton Rouge, Louisiana. Ms. Byrd stated that her duty tours were about evenly divided between the two locations and that she had been used as a yardmaster at Geismar. She estimated that 75 percent of her Baton Rouge duty tours were on the 11:00 p.m. to 7:00 a.m. operator-caller assignment. Ms. Byrd stated that she had received no formal training in the operation of locomotives, but had frequently operated locomotives in the yard at Geismar. She stated that she had never ridden or operated a locomotive on the Hammond District.

Ms. Byrd described herself as an alcoholic and said that she had been hospitalized for alcoholism early in 1981. She also stated that she had abstained from alcoholic consumption for about 11 months prior to the accident and that during this period she had been an active participant in either an alcohol rehabilitation or a chemical dependency program.

APPENDIX C

EXCERPTS FROM ILLINOIS CENTRAL GULF TIMETABLE AND OPERATING RULES

ILLINOIS CENTRAL GULF RAILROAD

These rules govern the railroads operated by the Illinois Central Gulf Railroad

They take effect July 1, 1974, superseding all previous rules and instructions inconsistent therewith

Special instructions may be issued by proper authority.

Chief Transportation Officer

Approved:

Senior Vice President—Operations

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

G(1) The use of any medicine, tranquilizer, sedative or related substance to an extent which might impair the ability of an employe to properly perform his duties is prohibited when the employe is subject to or is on duty Use of such medicines, tranquilizers, sedatives or related substances, to such an extent, even though prescribed by a physician, does not relieve the employe of the responsibility of notifying his immediate superior that he should not be subject to duty due to the use of such medications, nor shall alleged ignorance or lack of knowledge of the effects of such medication relieve the employe of this responsibility

H Dishonesty, desertion from duty, insubordination, willful neglect, gross carelessness, making false reports or statements, concealing facts concerning matters under investigation, immoral character or serious violations of the law, are prohibited

Employes are forbidden to make unauthorized charges for service performed in line of duty

P Employes must not engage in other business, absent themselves from duty, engage a substitute to perform their duties, nor exchange duties with others without authority

Employes must report for duty at the designated time and place and those subject to call must not leave their usual calling place without leaving information as to where they can be located

Employes must give immediate notice of change of residence or telephone number to trainmaster and crew caller

RULES FOR MOVEMENT BY TRAIN ORDERS

205. Conductors and enginemen must (and trainmen will, when practical) read train orders, clearance and register check and have a definite understanding of their requirements If necessary, other crew members must remind conductor or engineer of such requirements, and the time of superior trains which must be cleared

When a conductor or engineer, or both, is relieved before the completion of a trip, all train orders and instructions held must be delivered to the relieving conductor or engineer Such orders or instructions must be compared by the conductor and engineer before proceeding

206 In transmitting and repeating train orders, the order number and the train and engine numbers must be plainly pronounced and each figure repeated separately Numbers below 10 will be spelled in addition to pronouncing them, the names of stations and time numerals will be first plainly pronounced, then spelled, letter by letter; as,

No 1 (O-N-E) Eng 4017 (4-0-1-7) meet No 16 (1-6) Eng 4021 (4-0-2-1) at Scott (S-C-O-T-T)

No 1 (O-N-E) Eng 4017 (4-0-1-7) wait at Scott (S-C-O-T-T) until 1:25 (O-N-E T-W-O F-I-V-E) PM for Extra 4021 (4-0-2-1) North

No 22 (2-2) Eng 4017 (4-0-1-7) run 25 (T-W-O F-I-V-E) Mins late Scott (S-C-O-T-T) to Mason (M-A-S-O-N)

221 (i) On trains equipped with radio, conductor and engineer, after receiving train orders, must promptly communicate with each other as to requirements of such orders Radio communication will not relieve either of receiving their copes If necessary, train must be stopped for receipt of orders

225 The following signals, abbreviations and designations may be used:

Initials for signature of superintendent-transportation and train dispatcher
ABS – automatic block signal system
C&E – conductor and engineer

EMPLOYES GENERAL

701. Employes must understand and comply with safety rules, air brake rules and other rules and instructions applicable to or affecting their duties

704 Employes whose duties are connected with the movement of trains must be familiar with the rules governing the duties of others as well as of themselves and be prepared, in case of emergency, to act in their capacity to ensure the safety of trains

707. Persons, except officers of the railroad and employes in the discharge of their duties, will not be permitted to ride on engines without written authority of proper officer Unauthorized persons will not be permitted to ride in baggage, mail or express cars, or on freight trains

712 When the conductor is not present, brakemen on engine must promptly obey instructions of the engineer relating to the safety and protection of the train, and must immediately call attention of the engineer to any apparent failure to observe train orders, or to comply with any rules or instructions.

713 The conductor and engineer and anyone acting as pilot are equally responsible for safety of train and observance of rules, and under conditions not provided for by the rules, must take every precaution for protection.

715 Conductors and engineers must see that their subordinates are familiar with their duties, determine the extent of their experience and knowledge of the rules, and instruct them, when necessary, in safe and proper performance of their duties Incompetence must be reported to their immediate supervisor.

CONDUCTORS

770 Conductors report to and receive instructions from the trainmaster and must obey instructions from superintendent-transportation.

They will be governed by instructions of agents regarding station switching

They will obey instructions of yardmasters

771 Conductors have charge of the trains to which they are assigned and of all employes thereon. They are responsible for the safe and proper management of their trains, for the protection and care of passengers and property, for performance of duty by train employes, and for the observance and enforcement of all rules and instructions.

Should there be any doubt as to authority or safety of proceeding, from any cause, he must consult with the engineer and be equally responsible with him for the safety and proper handling of the train and for such use of signals and other precautions as the case may require.

YARDMASTERS

795. Yardmasters are responsible for the safe, efficient and economical operation of yards and the prompt movement of cars and trains. They have jurisdiction over all trains, engines and employes in yards.

ENGINEERS

800 Engineers report to and receive instructions from the trainmaster and traveling engineer They must comply with instructions of proper officers and supervisors of the mechanical department pertaining to mechanical matters.

801. They must comply with the conductor's instructions, except when such instructions imperil the safety of train or themselves or involve violation of rules

The presence of a traveling engineer or other officer on the engine will not relieve them from remaining on the engine, nor of the responsibility of compliance with rules.

802. They will have charge of the train when there is no conductor or the conductor is disabled and will be governed by rules applying to conductors.

806 They must not permit unauthorized persons to operate the engine The fireman or other authorized employe on the crew may be permitted to do so with the permission and in the presence of the engineer, who will be responsible for the proper operation of the engine and handling of the train Traveling engineers are authorized to operate the engine to instruct or for other purposes

ILLINOIS CENTRAL GULF RAILROAD OPERATING RULES SUPPLEMENT NO 1 (January 1, 1978)

Following Operating Rule changes were effective on dates indicated:

Definition of Yard Limits A portion of main track designated by special instructions or train order Form Q, and identified by yard limit signs (Revised August 1, 1977)

34. Employes located in the operating compartment of an engine must, and other crew members will, when practical, communicate to each other in an audible and clear manner the name or aspect of each signal affecting movement of their train or engine, as soon as the signal is clearly visible or audible It is the responsiblity of the engineer to have each employe in cab of engine comply with these requirements, including himself.

Each fixed signal must be watched until such signal is passed and if it displays an indication other than that first communicated, the change must be communicated as soon as it becomes clearly visible

It is the engineer's responsiblity to have each employe located in the operating compartment maintain a constant lookout for signals and conditions along the track which affect the movement of the engine or train

If a crew member becomes aware that the engineer has become incapacitated or should the engineer fail to operate or control the engine or train in accordance with signal indications or other conditions requiring speed to be reduced, other members of the crew must communicate with the engineer at once, and if he fails to properly control the speed of the train or engine, other members of the crew must take action necessary to ensure the safety of the train or engine, including operating the emergency brake valve. (Revised January 1, 1978)

93. Within yard limits, the main track may be used without authority conferred by timetable schedule, train order or clearance

Within yard limits, trains or egnines must not be moved against the current of traffic unless authorized by person in charge of yard who will make provision for protection of the movement, and such movement will be made at YARD SPEED, not exceeding 20 MPH

Within yard limits established by train order, trains or engines must have copy of such train order with a clearance

Within yard limits, flag protection is not required against other trains or engines, but all trains or engines must move at YARD SPEED, not exceeding 20 MPH, unless the main track is known to be clear by block signal indication in ABS territory When a main track is not known to be clear by block signal indication, trains or engines must be prepared to stop within one-half the range of vision, in addition to observing speed requirements of such block signal indication.

Within yard limits, trains or engines will keep informed of expected time of arrival of first class trains to avoid delaying them (Revised August 1, 1977)

99. When a train is moving on a main track at less than one-half the maximum authorized timetable speed for any train at that location, under circumstances in which it may be overtaken, a crew member must put off single burning fusees at rear of train at intervals that do not exceed the burning time of the fusee.

When a train is moving on a main track at or more than one-half the maximum authorized timetable speed for any train at that location, under circumstances in which it may be overtaken, crew members responsible for providing protection must consider grade, track curvature, weather conditions, sight distance, and speed of the train relative to following trains, when deciding if burning fusees should be put off.

When a train stops on a main track, under circumstances in which it may be overtaken, protection against following trains on the same track must be provided. A crew member must go back immediately with flagman's signal equipment one-half the required distance where he will place two torpedoes on the rail, and continue to the required distance from rear of train, where he will place two torpedoes on the rail and place a burning fusee If no following train is seen or heard, he may return one-half the distance to the rear of his train where he must remain until he has stopped a following train or is recalled When recalled and no following train is seen or heard, he must leave a burning fusee, and while returning to train, must leave burning fusees at intervals that do not exceed the burning time of the fusee.

Following are the minimum flagging distances corresponding with the maximum authorized speed of approaching trains:

Maximum Authorized Speed	Minimum Flagging Distance
0 - 10 MPH	1/4 Mile
11 - 20 MPH	1/2 Mile
21 - 30 MPH	3/4 Mile
31 - 40 MPH	1 Mile
41 - 50 MPH	1-1/4 Mile
51 - 60 MPH	1-1/2 Mile
61 - 70 MPH	1-3/4 Mile
71 - 80 MPH	2 Miles
81 - 90 MPH	2-1/4 Miles

714. Other members of the crew must call attention of conductor or engineer immediately to any apparent failure to observe the requirements of rules, timetable, train orders, messages or other instructions

When conditions require that the train be stopped or speed of train be reduced and the engineer or conductor fails to take proper action to do so, other members of the crew must take immediate action to stop the train, using emergency brake valve if necessary (Revised January 1, 1978)

RADIO OPERATIONAL RULES

The following rules cover use of railroad radio communication systems and govern employes using such systems (Revised August 1, 1977)

870. The radio must be used only in connection with railroad business and in compliance with the operating rules

Employes whose duties require the use of the railroad radio communication system must familiarize themselves with and obey these rules

873. An emergency call must be preceded by the word "Emergency" repeated three times Such calls must be used only to cover initial reports of derailments, collisions, storms, washouts, fires, obstructions to track, or other matters which would cause serious delay to traffic, damage to property, injury to employes or the traveling public, and contain as complete information thereon as possible All employes must give absolute priority to emergency calls from another station and, except in answering or aiding a station during an emergency, must refrain from sending any communication until there is assurance that no interference will result to the station initiating emergency calls.

874. No employe shall knowingly transmit any false emergency communication, any unnecessary, irrelevant or unidentified communication, nor utter any obscene, indecent, or profane language via radio

885. When radio is used to transmit train orders, rules for movement by train order and the following instructions apply:

(a) When a train order is to be transmitted directly to a train by radio, the train dispatcher (or operator, if an operator is to relay the train order) will call the train and state this fact. The crew members who are to copy the order must state their names, positive identification and exact location and that they understand a train order is to be transmitted and that they are prepared to receive it.

(b) Train orders may be transmitted by radio directly to a moving train but must not be copied or repeated by an employe operating the controls of the engine of such train.

(c) Train orders must not be transmitted to the crew of a moving train when, in the judgment of the conductor, the engineer or the train dispatcher, the order cannot be received and copied without impairing the safety of the train.

(d) Train orders transmitted by radio directly to a train must be copied and repeated by a crew member or other qualified employe. When crew member on rear of train has no means of receiving the order, train order must not be transmitted by radio directly to the train.

(e) "Complete" must not be given to a radio-transmitted train order until it has been repeated and train dispatcher has verified the accuracy of the repetition Train dispatcher will then state "Complete", the time, and his initials Crew members copying the order must then acknowledge by repeating "Complete" and the time

ILLINOIS CENTRAL GULF RAILROAD

RULES AND INSTRUCTIONS

GOVERNING TRAIN HANDLING

AND OPERATION

OF

AIR BRAKE, OTHER PNEUMATIC

EQUIPMENT AND STEAM HEAT ON LOCOMOTIVES

AND CARS

These rules govern the railroads operated by the Illinois Central Gulf Railroad

They take effect Jan 1, 1980 superseding all previous rules and instructions inconsistent therewith

Special instructions may be issued by proper authority

J E Martin
Sr Vice President — Operations

P C SWITCH RECOVERY INFORMATION

Rule 23 2 (b) Units with Train
Recovery from Emergency
26L — Move throttle to idle
Place automatic brake valve handle in emergency position, wait 60-70 seconds and move handle to running position

INDEPENDENT BRAKE VALVE OPERATION

Rule 38 3 The SA26 Independent Brake Valve is self-lapping It is mounted on the front of the Automatic Brake Valve Pipe Bracket The brake valve handle has two positions, namely Release Position at the extreme left end of the quadrant and Full Application Position at the extreme right end of the quadrant From Release to Full Application Position is an application zone and the further the handle is moved to the right into this zone, the greater the application will be until a full application is obtained at the extreme right end of handle movement

(a) Depression of the Independent Brake Valve Handle in Release position will effect the release of any automatic brake application on the locomotive Depression of the Independent Brake Valve Handle with it somewhere in the application zone will release an automatic application only to the value corresponding to the position of the handle in the application zone

(b) When applying the locomotive brake with the SA-26 Independent Brake Valve, move the handle to the right (full independent application—extreme right), and when releasing, move the handle to the left The Brake Valve being self-lapping, will lap off automatically at any point in the application zone when the handle movement has been stopped

Rule 208.9 When an emergency application is to be initiated by the engineer, or is initiated by action other than the automatic brake valve

(a) Immediately place the automatic brake valve in emergency position

(b) Move the throttle to idle

(c) Regulate the independent brake cylinder pressure to maintain the maximum pressure without sliding the wheels

EXCEPTION: If train is in a slack stretched condition, particularly with long overhang cars at the head end of the train when an undesired emergency occurs, prevent the locomotive brakes from applying to reduce buff forces at the head end

209 USE OF THE INDEPENDENT BRAKE VALVE — GENERAL

Rule 209 Probably no element of braking can create train shock conditions more severe than the improper use of the independent brake The proper use of the independent brake will not produce rough slack action or slide wheels

Rule 209.1 Normally, freight train slow downs and/or stops must be made with the automatic train brake and/or the dynamic brake

EXCEPTION: When slowing or stopping a train with the slack bunched (dynamic brake not available), and when speed, train make-up, grade or other conditions permit, the locomotive independent brake may be allowed to apply in conjunction with the automatic brake

Rule 209.3 When necessary to release the independent brake or reduce brake cylinder pressure for any reason with train brakes applied depress the handle of the independent brake valve If the handle is depressed while in the application zone, the brake cylinder pressure will be reduced to the pressure corresponding to the position of the independent brake valve handle in the application zone (Applies only to 24RL and 26L brake equipment) With 6BL equipment, the independent brake valve handle must be moved to full release position and depressed to make any release of the independent brake

Rule 209.9 When operating a multiple unit locomotive consist and it is desired to prevent the locomotive brake from applying during an automatic brake application, the independent brake valve handle must be depressed in release position for at least 4 seconds per unit for each unit in the consist

MISSISSIPPI DIVISION OFFICERS

H D GRANBERRY, JR., Superintendent	Vicksburg
L R STEARNS, Terminal Superintendent	New Orleans
H L CRADDOCK, Assistant Superintendent	Vicksburg
J A PAUL, Assistant Superintendent	Jackson
A L PHIPPS, Senior Trainmaster	New Orleans
J D DUFF, Trainmaster	Jackson
T J BENNETT, Trainmaster	Jackson
G D HARMON, Trainmaster	Vicksburg
F A ELKINS, JR., Trainmaster	McComb
J C FREEDMAN, Trainmaster	Baton Rouge
R D JOBE, Trainmaster	Baton Rouge
D L WHITCHURCH, Trainmaster-Trav-Engr	Baton Rouge
L J CLINE, Trainmaster	New Orleans
B IVEY, Assistant Trainmaster	Bossier City
W A EASTMAN, Assistant Trainmaster	Monroe
S G ESTESS, Assistant Trainmaster	Jackson
J D ROSE, Assistant Trainmaster	Jackson
J L WILLINGHAM, Assistant Trainmaster	Brookhaven
D A BELL, Assistant Trainmaster	McComb
G W ROSS, Assistant Trainmaster	Baton Rouge
W J LANDRY, JR., Assistant Trainmaster	Geismar
J P LENOIR, Assistant Trainmaster	Geismar
L E PHELPS, Assistant Trainmaster	Reserve
W H STANDBERRY, Assistant Trainmaster	Good Hope
D J DURAND, Assistant Trainmaster	Bogalusa
J J KING, Assistant Trainmaster	New Orleans
W E ANDERSON, Traveling Engineer	Vicksburg
D A DIESTELMEIER, Traveling Engineer	Jackson

SPEED TABLE

This is not for authorized speed, but for information only

Seconds Per Mile	Miles Per Hour	Seconds Per Mile	Miles Per Hour
46	79	80	45
48	75	90	40
52	70	103	35
55	65	120	30
60	60	144	25
65	55	180	20
72	50	240	15
75	48	360	10

Illinois Central Gulf Railroad

Mississippi Division

TIMETABLE No. 3

Effective 12:01 A.M.
SUNDAY OCTOBER 25,1981

Superseding Mississippi Division Timetable No 2
Dated April 26, 1981

FOR THE GOVERNMENT OF EMPLOYES ONLY

I B HALL, Vice President and Chief Transportation Officer
R K OSTERDOCK, Assistant Vice President-Transportation
J E MOSS, Superintendent-Transportation

Southward		McCOMB DISTRICT					Northward	3
FIRST CLASS		Siding Capacity			TIMETABLE NO 3 Effective October 25, 1981		FIRST CLASS	
51	59	Feet in Length	Cars—55 Feet and 4 Units	Mile Posts	STATIONS	Miles from New Orleans	58	50
Piggy Back	City of New Orleans						City of New Orleans	Piggy Back
Daily	Daily							
L 6 01 PM	L a 10 02 AM			806 9	McCOMB	106 4	A a 4 42 PM	A 11 20 PM
5 04	10 05			808 7	1.8 C SOUTH YARD	103 6	4 37	11 14
				810 8	2.1 FERNWOOD	101 5		
				814 0	3.2 MAGNOLIA	98 3		
				820 0	6.0 CHATAWA	92 3		
				823 9	3.9 OSYKA	88 4		
5 26	10 22	4565	83	829 0	5.1 KENTWOOD	83 3	4 19	10 51
				833 4	4.4 TANGIPAHOA	78 9		
				837 0	3.6 FLUKER	75 3		
		4180	76	840 8	3.8 ROSELAND	71 5		
5 42	10 34			843 5	2.7 AMITE	68 8	4 07	10 35
				849 9	6.4 INDEPENDENCE	62 4		
				854 1	4.2 TICKFAW	58 2		
6 01	a 10 53	4235	77	859 0	4.9 D HAMMOND	53 3	a 3 53	10 16
6 04	10 55			861 5	2.5 OLIVER	50 8	3 45	10 12
				863 9	2.4 PONCHATOULA	48 4		
		9845	179n	874 5	10.6 MANCHAC	37 8		
		10835	179n 197	887 6	13.1 FRENIER	24 7		
6 45	11 29			898 6	11.0 SKIP	13 7	3 15	9 34
A 6 50 PM	A 11 32 AM			900 8	2.2 ORLEANS JCT	11 5	L 3 12 PM	L 9 31 PM
							Daily	Daily

Southward			NEW ORLEANS DISTRICT				Northward		
FIRST CLASS					TIMETABLE NO. 3 Effective October 25, 1981		FIRST CLASS		
111	51	59					58	50	106
SP 2	Piggy Back	City of New Orleans			STATIONS		City of New Orleans	Piggy Back	SP 1
Sun. Tues. Thurs	Daily	Daily							
	L 6 50 PM	L 11 32 AM		900 8	ORLEANS JCT	11 5	A 3 12 PM	A 9 31 PM	
				901 8	1.0 KENNER	10 5			
	6 59	11 39		904 4	2.6 C MAYS YARD	7 9	3 07	9 27	
L 7 17 PM	7 03	11 43		906 4	2.0 EAST BRIDGE.	5 9	3 04	9 24	A 2 03 PM
A 7 20 PM	7 07	A 11 45 AM		908 6	2.2 SOUTHPORT JCT	3 7	L 3 02 PM	9 21	L 2 00 PM
	A 7 25 PM			914 4	5.8 STY DOCKS			L 9 01 PM	
TO BE GOVERNED BY RULES AND TIME TABLE OF NEW ORLEANS UNION PASSENGER TERMINAL									
A 8 10 PM		A 12 15 PM			3.7 NEW ORLEANS	0.0	L 2 55 PM		L 1 50 PM
							Daily	Daily	Mon Wed Fri

4 Southward — **BATON ROUGE DISTRICT** — Northward

Siding Capacity: Feet in Length	Siding Capacity: Cars—55 Feet and 4 Units	Mile Posts		TIMETABLE NO 3 Effective October 25, 1981 STATIONS	Miles from New Orleans
		362 5		M P JCT	93 2
				1 1	
		363 6	C	NORTH BATON ROUGE	92 1
				1 2	
		364 8		BATON ROUGE JCT	90 9
				1 4	
		366 2		BATON ROUGE	89 5
				3 0	
4675	85	369 2		UNIVERSITY	86 5
				11 3	
4160	76	380 5		ST GABRIEL	75 2
				6 0	
7865	143	386 5		OLD GEISMAR	69 2
				3 1	
		389 6	D	GEISMAR	66 1
				4 4	
		394 0		BURNSIDE	61 7
				11 2	
4455	81	405 2		CONVENT	50 5
				5 0	
		410 2		REMY	45 5
				3 0	
		413 2		LUTCHER	42 5
				0 8	
		414 0		GRAMERCY	41 7
				2 2	
7590	138	416 2		MT AIRY	39 5
				2 0	
		418 2		GARYVILLE	37 5
				3 3	
		421 5		RESERVE	34 2
				3 9	
		425 4		WALTER	30 3
				0 6	
		426 0		LA PLACE	29 7
				5 9	
		431 9		SELLERS	23 8
				1 5	
		433 4		GOOD HOPE	22 3
				4 0	
		437 4		DESTREHAN	18 3
				2 7	
		440 1		ST ROSE	15 6
				4 1	
		444 2		ORLEANS JCT	11 5

Westward — **HAMMOND DISTRICT** — Eastward

Siding Capacity: Feet in Length	Siding Capacity: Cars—55 Feet and 4 Units	Mile Posts		TIMETABLE NO 3 Effective October 25, 1981 STATIONS	Miles from Hammond
		43 7	D	HAMMOND	0 0
				7 4	
		36 3		ALBANY	7 4
				9 2	
		27 1		DOYLE	16 6
				6 6	
6050	110	20 5		CORBIN	23 2
				6 5	
		14 0		DENHAM SPRINGS	29 7
				6 1	
		7 9		SHARP	35 8
				7 9	
		0 0		BATON ROUGE JCT	43 7

SPECIAL INSTRUCTIONS

101 Speed restrictions: Speeds shown are maximum authorized between points named but do not modify any rule or special instructions which may require lower speed

TERRITORY OR LOCATION	Passenger Trains	Freight Trains
	Miles Per Hour	
Between:		
Meridian and Shreveport	—	45
Freight Yard and Port Gibson	—	20
Crosby and MP Jct	—	40
West Monroe and Winnfield	—	20
Silver Creek and Columbia	—	10
Hattiesburg and Natchez	—	35
Gwin and Cynthia	—	49
Cynthia and North Jackson	—	20
*Canton and Skip	79	50
Skip and Southport Jct	60	40
Southport Jct and Sty Docks	—	20
Sty Docks and Levee Yard	—	10
MP Jct and Orleans Jct	—	40
Baton Rouge Jct and Hammond	—	40
Slaughter and Zee	—	20
Zee and Argue	—	10
Wanilla and Slidell	—	25
North Slidell and Covington	—	25
Moving against current of traffic	55	40
*Trains consisting of all TOFC equipment	—	60
101(a) Lower Speeds:		
Diverging routes through crossovers, junctions and siding switches:		
No 20 crossovers and turn outs:		
Skip, end of two tracks	40	40
Oliver, end of two tracks	40	40
No 15 crossovers and turnouts:		
Freight Yard (Shreveport District) crossover	20	20
Baton Rouge Jct (Hammond District) turnout east end of Wye	—	10
Mile 388 2, (Baton Rouge District) through turnouts	—	25
North and South Manchac, each end of siding	25	25
Frenier—Each end of siding	25	25
Orleans Jct —Switch to Baton Rouge District	25	25
Orleans Jct —South crossover interlocking	25	25
Mays Yard—Lead switch Mile 903 6, North of Little Farms crossing	25	25
Mays Yard—North end crossover to north main track	25	25
Mays Yard—North end crossover switches south main track	25	25
Southport Jct —North end long crossover	25	25
Through turn outs at spring switches unless other wise authorized	25	25
Through turn outs at following spring switches:		
Shreveport—Spring Street Jct, east end two main tracks, west end two main tracks and Mile 169 3	10	10
On straight track at spring switches when springing points	40	40
Through turn outs at other locations	10	10

TERRITORY OR LOCATION	Passenger Trains	Freight Trains
	Miles Per Hour	
HAMMOND DISTRICT:		
Hammond: Between Mile 42 7 and Mile 43 5, all crossings (See Note B)	—	10
Curve—Mile 43 7	—	10
Between Mile 25 7 and Mile 27 5..	—	35
Between Mile 21 1 and Mile 8 7	—	25
Mile 7.7, Sherwood Forest Blvd, (See Note B)	—	10
Mile 6 3, Monterrey Blvd, (See Note B)	—	10
Mile 4 9, Between Airline Highway and Baton Rouge Jct	—	10

111 (e) Defective Equipment Detectors:

Detector Centers have radio communication with trains passing defective equipment detectors at the following locations:

Locations	Detector Center
YAZOO DISTRICT Bentonia (Mile M-192 62)	Chicago
CANTON DISTRICT Hazlehurst (Mile 764 52)	Chicago
MCCOMB DISTRICT Arcola (Mile 839 72) Manchac (MP 869)	Chicago
HAMMOND DISTRICT Lockhart (Mile LZ-17 16)	Chicago
BATON ROUGE DISTRICT Burtville (Mile L-374 95) Belmont (Mile L-408 77)	Chicago
MERIDIAN DISTRICT Clarksburg (Mile VM-64 70) Bolton (Mile VM-112 95)	Chicago
SHREVEPORT DISTRICT Bee Bayou (Mile VD-47 16) Simsboro (Mile VD-119 54)	Chicago

1 When a defect is detected, the Detector Center will notify the train to stop

SPECIAL INSTRUCTIONS

1208. SWITCHING RESTRICTION FOR HAZARDOUS MATERIAL

Loaded placarded cars containing "EXPLOSIVES A", "EXPLOSIVES B', "POISONOUS GAS", "FLAMMABLE GAS', "RADIOACTIVE MATERIAL" and all flat cars carrying placarded trailers or containers are restricted as follows:

A Must not be humped kicked or allowed to roll free

B Must not be coupled to another car with more force than necessary to make the coupling.

C Other free rolling cars must not be allowed to couple directly to these restricted cars

Switch lists provided switching crews must clearly indicate the presence of these cars At the beginning of each shift, switching crews must determine whether or not any of these cars are first out on each track to be switched Before humping kicking or allowing any car to roll free onto a track having a restricted car first out, a non-restricted car must be shoved to a coupling with the restricted car

During switching operations cars placarded "EXPLOSIVES A" must be separated from the engine by at least one (1) non placarded car Cars placarded "EXPLOSIVES A ' must be placed so they will be safe from all probable danger of fire They must not be placed under a bridge or overhead highway crossing nor in or along side of passenger shed or station except for loading or unloading purposes

At specific locations, these instructions may be modified by Superintendent's Bulletin Order

1209 Federal Regulations require that the train crew must have a document indicating the position in the train of each loaded placarded car containing hazardous materials, except when the position is changed or the placarded car is placed in the train by a member of the train crew A train consist may be used to meet this requirement

Conductors will notify their engineer when placarded cars are in the train and advise him of their position in the train

When placarded cars are picked up at intermediate points, conductors will notify their engineer and advise him of their position in the train

These requirements are in addition to the ' Notice of Cars Containing Explosives A or Poisonous Gas', Form F-0310

1210 HANDLING GUIDELINES FOR ACCIDENT INCIDENT —TRAIN CREWS HANDLING

1 Notify Trains Despatcher (or other proper officer) immediately by radio or telephone
2 Determine from waybills and train consist the commodities involved
3 If Hazardous Materials are involved, advise the Train Dispatcher of these commodities first and inform him if they are leaking or if a fire is involved in the accident
4 If 'CLASS A POISON" is involved, notify other crew members to stay clear of accident and await arrival of qualified response trouble shooters; KEEP ALL SPECTATORS AWAY
5 If fire or spill of Hazardous Materials pose a threat to nearby residents, train crew must alert residents to evacuate the area immediately
6 Conductor must be available to advise emergency response force (Fire & Police, etc) concerning contents of cars involved, and will furnish copy of emergency response data, printed at end of train consist, if available
7 Conductor must remain near the scene to furnish any necessary information that may be requested by emergency response forces until relieved of the responsibility by the railroad transportation officer at the scene

1210 (Continued)

EMERGENCY TELEPHONE NUMBERS
Illinois Central Gulf Railroad
Superintendent—Transportation
(312) 565-1600 Ext 2726

Bureau of Explosives
Washington, D C
(202) 293-4048

CHEMTREC
Washington, D C
(800) 424 9300

The Communicator at CHEMTREC will:
1 Receive details on the situation
2 Furnish CHEMCARD information on action to take (i e stay away, evacuate fire control etc)
3 If additional assistance is required he will contact member company or subscriber nearest scene of accident who will handle direct with caller to best resolve specific problems

1211 HYDROCYANIC ACID FLAMMABLE POISONOUS GAS

The following instructions will apply to tank cars loaded with Hydrocyanic Acid (HCN) or an empty HCN Tank Car

HAZARDS:

HCN is extremely hazardous by inhalation, by contact with the skin and by ingestion Exposure to excessive concentration of vapor may result in instantaneous loss of conciousness and death without warning In the event of a spill or leak of the liquid material, the area should be roped off and warning signs posted until decontamination has been completed by trained personnel

Although HCN has a characteristic sweetish odor like bitter almond, its toxic action at hazardous concentrations is so rapid that it is of no value as a warning

SPECIAL PRECAUTIONS:

In the event of derailment or other suspected leakage of an HCN tank car the wind direction should be determined before an approach to the car is made and the car should be approached from the *upwind side* All persons should by kept away from the car Police and fire fighting forces should be instructed in the hazards of the lading *If the car is actually involved in a fire or if it is burning at the dome or from any other possible leak it should be permitted to continue burning* If the car is not actually involved in a fire IT MUST BE LEFT ALONE PENDING THE SHIPPER S INSTRUCTIONS A derailed HCN tank car shall not be rerailed rigged for hoisting by crane or other work done on it except as instructed by the shipper It is most important that no flame cutting, welding or other hot work be performed on the car until the shipper's authorization is given by his representative at the scene

NOTIFICATION:

In the event of wreck, derailment, leakage or other problem involving a HCN tank car, call the following number:
CHEMTREC
800-424 9300

SWITCHING:

Neither loaded or empty HCN cars may be cut off while in motion No car moving under its own momentum shall be allowed to strike either a loaded or empty HCN car

1212 When it is necessary for the conductor and other members of the crew to move to the head end of the train leaving the caboose unoccupied, a member of the crew must have the waybills in his possession at all times

Should there be a derailment involving hazardous material the waybills will be readily available to authorities for questions concerning the consist of the train

1213 In order to provide on-board emergency information about hazardous materials, a copy of the Bureau of Explosives Book "Emergency Handling of Hazardous Materials in Surface Transportation" is being provided in each caboose The book is in a metal container secured to the caboose wall above the conductor's desk and the container lid sealed with a car seal

In the event of an incident involving hazardous materials, the conductor will provide on scene emergency service personnel with the guidebook and any billing and consist information appropriate Train crews are not expected to familiarize themselves with the contents of the guidebook nor to become directly involved in handling hazardous materials incidents The car seal must not be broken nor the book removed except under circumstances involving hazardous materials incidents

Because of the importance of the guides, any found missing from its container must be reported in order that it may be replaced

It must be understood that the seal is to be broken and book removed only when hazardous materials incidents are involved Employes breaking the seal or removing the books at other times will be subject to discipline

APPENDIX D

EXCERPTS FROM ILLINOIS CENTRAL GULF MICROWAVE RADIO TAPE

5:12:35	Conductor - I. L. Robinson	Still moving?
	Unknown	Yeah
	Robinson	Well, we're coming to a stop - - - one of them bad holes.
	Unknown	(unintelligible)
	Unknown	- - them cars explode?
5:12:54	Robinson	I see it. Call the dispatcher.
	Unknown	(unintelligible)
	Engineer - E.P. Robertson	G-S-two to Mays Yard. Emergency!
5:14:12	Robertson	G-S-two to Mays Yard. Come on in there, Mays Yard!
	Robertston	G-S-two to Mays Yard!
5:14:35	-	(Loud buzz)
	-	(Loud buzz)
	Dispatcher	Hammond District dispatcher, over.
5:14:50	Robertson	Hammond District dispatcher, this is G-S-two. Look, we got a mess down here. The whole world's on fire. Somewhere between Hammond and Baton Rouge. I can't -. Let me, let me get right back to ya' and tell ya' exactly where we are. Hang on just a second.
	Dispatcher	Alright.
5:15:00	Robertson	We're at Doyle, Mississippi. Doyle, Miss -, I mean Doyle, Louisiana. Doyle, Louisiana. We've got a mess back there.
5:15:10	Dispatcher	Your train's on fire, is that it?
	Robertson	We are on fire. We're on fire. We've turned 'em over and the whole world's on fire back there.
5:15:14	Robinson	They's a explosion. The cars - up five hundred feet in the air.

5:49:39	Robertson	- Have you got an order for us, Baton Rouge?
5:49:43	Klibert	- Yes, I have a train order for you.
5:49:45	Robertson	- Alright, give it to me.
5:49:47	Klibert	- Train order number seven, S-E-V-E-N. To C and E Extra ninety-six twenty-nine, nine six two nine, East, E-A-S-T, at Doyle, D-O-Y-L-E, by radio, period.
5:50:27	Robertson	- Alright.
	Klibert	- Order number three, T-H-R-E-E, is annulled
5:50:42	Robertson	- Alright.
	Klibert	- Signed J-E-M
5:51:00	Robertson	- Alright, Order number seven, C and E Extra nine six two nine via Radio at Doyle. Order number three is annulled. Signed J-E-M.
5:51:10	Klibert	- That order is Extra ninety-six twenty-nine East at Doyle by radio.
5:51:18	Robertson	- Ninety-six twenty-nine at Doyle via radio.
5:51:23	Klibert	- Alright, I need your name and the conductor's name, sir.
5:51:27	Robertson	- E-P Robertson, engineer. I-L Robinson, R-O-B-I-N-S-O-N, conductor.
5:51:39	Klibert	- Your initials?
	Robertson	- E-P R-O-B-E-R-T-S-O-N, engineer. I-L R-O-B-I-S-O-N R-O-B-I-N-S-O-N, conductor
5:52:01	Klibert	- Initials - - -
	Robertson	- What did you say? I can't hear ya.
	Robertson	- Yeah -
5:52:21	Robertson	- Alright. Come out of Baton Rouge, Frank. He gonna give you another one in just a second. He's just lookin' at that. Just a second.
5:52:34	Klibert	- Baton Rouge operator to the Extra Ninety-six twenty-nine East, over.
5:52:39	Robertson	- That is Ninety-six twenty-nine east.
5:52:42	Klibert	- Alrighty, make that order complete at five fifty-one A-M. W-I-S
5:52:51	Robertson	- Five fifty-one W-I-S. Thank you.

	Superintendent J. A. Paul	-	I-C-G Car Two to Mays Operator.
	Unknown	-	That's right
	Unknown.	-	(unintelligible)
	Unknown	-	(unintelligible)
6:30:39	Paul	-	I'll be out of Car two. If you need me to relay anything to me, now we're here at Hammond on the big radio.
	Mays Operator	-	Alright. Have you heard anything else. Is the fire still burning?
6:30:46	Paul	-	I haven't heard anything, yet. I just walked into the depot here. All I know is what I heard before I left and what I heard on the radio.
	Unknown	-	Alright, - -.
	Unknown	-	(unintelligible)
6:30:58	Paul	-	Hammond depot to head end of G-C-two, Peyton Robertson, over.
	Robertson	-	Alright, Jimmie
	Paul	-	Where you'all at, Peyton.
	Robertson	-	Downtown Doyle.
6:31:16	Paul	-	Doyle? Okay, alright.
	Robertson	-	I'm at the east end of Doyle woodyard
6:31:21	Paul	-	At the woodyard? Okay.

APPENDIX E

ASSOCIATION OF AMERICAN RAILROAD'S INSTRUCTIONS FOR MOUNTING BRAKE PIPE HOSE

Association of American Railroads

INSTRUCTIONS FOR MOUNTING NEW BRAKE PIPE HOSE OTHER THAN ARMORED TYPE

Standard

ADOPTED, 1948; REVISED, 1958, 1966, 1967

(1) New hose before being mounted shall have the inside lining inspected for defects by sighting through the hose into a 150-watt frosted electric light bulb In mounting hose, A A R Standard cement per Specification M-923 shall be used as a lubricant and applied to fittings; also, *sparingly*, to inner tube Coupling and nipple should be forced into hose up to the shoulder on these parts In applying clamps, care should be taken to place them about midway between the raised portion on the fittings and end of hose in accordance with Manual Page E-51 With bolt type clamps, the bolt should be inserted and nut drawn to a secure and uniform degree of tightness In so doing, care must be used not to damage the hose. Non bolt type clamps must be applied and clamped in accordance with manufacturer's instructions per clamping machine.

(2) Hose clamping machines must be operated, tested and maintained in accordance with manufacturer's instructions B-1 Hose Clamping Machine as per Descriptive Leaflet No 2416-1

(3) Reclaimed couplings must be cleaned, inspected, gaged, and tested on standard testing device (Manual pages B-69, B-70) Paragraph 6 provides for an alternate method of testing couplings after mounting on new hose

4) Nipples should be examined, threads cleaned and rethreaded if necessary Shank end of nipple must have sharp edges removed and raised portions made smooth without defacing contour of that part of casting . If shank end of nipple is excessively corroded, it must be scrapped Shank end of reclaimed nipples must be checked with shank gage as outlined on Manual page B-50A

(5) The word **TOP** cast on nipple must be applied to the hose as shown on Manual Page E-51.

(6) Brake pipe hose assembly, including gasket, before being placed in stock for service, must be tested by passing a 1-inch ball through same and subjected to an air pressure of 70 pounds and 140 pounds, respectively, while submerged in water If leakage occurs at the gasket groove, remove the gasket and make certain the groove and gasket are clean, and then retest If the leakage persists, the coupling must be rejected If leakage occurs as a result of porosity of the coupling casting, the coupling must be rejected. Couplings and hose must be free from leakage

APPENDIX F

CHEMICAL MANUFACTURERS ASSOCIATION PROPOSED "GOOD SAMARITAN" LEGISLATION

Model Legislative Language

To provide legal protection to Good Samaritans that assist in hazardous materials accidents.

Section 1 - Notwithstanding any provision of law to the contrary, no person who provides assistance or advice in mitigating or attempting to mitigate the effects of an actual or threatened discharge of hazardous materials, or in preventing, cleaning up, or disposing of or in attempting to prevent, clean up or dispose of any such discharge, shall be subject to civil liabilities or penalties of any type.

Section 2 - The immunities provided in Section 1 above shall not apply to any person:

(i) whose act or omission caused in whole or in part such actual or threatened discharge and who would otherwise be liable therefore, or

(ii) who receives compensation other than reimbursement for out-of-pocket expenses for its services in rendering such assistance or advice.

Section 3 - Definitions. As used in this act:

(i) "Discharge" shall include leakage, seepage, or other release.

(ii) "Hazardous materials" shall include all materials and substances which are now or hereafter designated or defined as hazardous by any state or federal law or by the regulations of any state or federal government agency.

(iii) "Person" shall include any individual, partnership, corporation, association, or other entity.

Section 4 - Nothing in Section 1 above shall be construed to limit or otherwise affect the liability of any person for damages resulting from such person's gross negligence, or from such person's reckless, wanton or intentional misconduct.