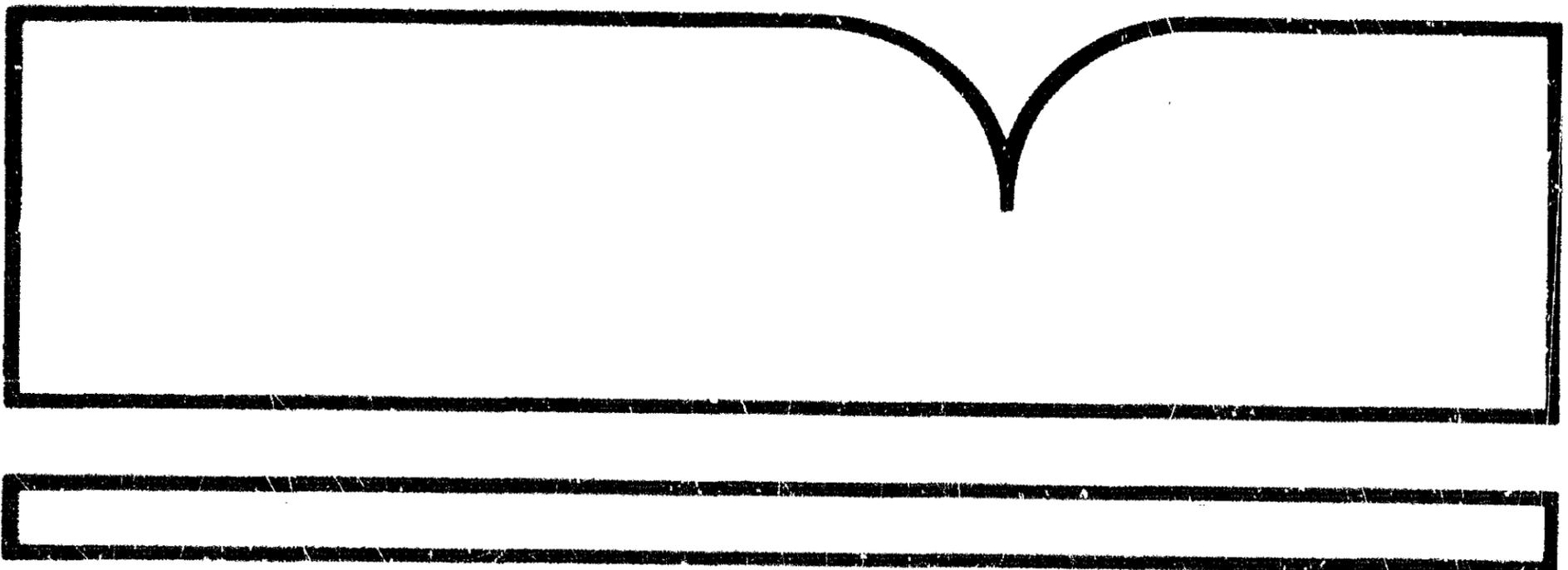


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Highway Accident Report
Schoolbus Rollover, State Route 88 near
Jefferson, North Carolina, March 13, 1985

(U.S.) National Transportation Safety Board
Washington, DC

10 Dec 85



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National Technical Information Service

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<p>16. Abstract About 12:20 p.m. on March 13, 1985, an Ashe County School District schoolbus, driven by a 17-year-old student driver and carrying 22 students, ages 16 and 17, was traveling up an 8-percent grade on eastbound State Route 88 near Jefferson, North Carolina, when it went off the right edge of the road in a left curve and crossed the grassy shoulder. The 1980 schoolbus then rolled one revolution to the right and down a steep embankment and came to rest upright 24 feet below the road surface against two trees. There was no fuel leakage or fire. It was daylight, the weather was clear, and the two-lane roadway was dry. One student was seriously injured, one sustained moderate injuries, and the other 20 had minor injuries; the schoolbus driver was not injured. None of the bus occupants were ejected from the schoolbus.</p> <p>The National Transportation Safety Board determines that the probable cause of the accident was the inattention of the 17-year-old student schoolbus driver to his driving task which resulted in the schoolbus leaving the road, loss of control, and a subsequent overturn of the schoolbus. Contributing to the accident was the distraction of the driver by the unruly behavior of the student passengers. Contributing to the severity of the accident was the lack of a guardrail to redirect errant vehicles away from the steep embankment.</p>					
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**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594**

HIGHWAY ACCIDENT REPORT

Adopted: December 10, 1985

**SCHOOLBUS ROLLOVER
STATE ROUTE 88
NEAR JEFFERSON, NORTH CAROLINA
MARCH 13, 1985**

SYNOPSIS

About 12:20 p.m. on March 13, 1985, an Ashe County School District schoolbus driven by a 17-year-old student driver and carrying 22 students, ages 16 and 17, was traveling up an 8-percent grade on eastbound State Route 88 near Jefferson, North Carolina, when it went off the right edge of the road in a left curve and crossed the grassy shoulder. The 1980 schoolbus then rolled one revolution to the right and down a steep embankment and came to rest upright 24 feet below the road surface against two trees. There was no fuel leakage or fire. It was daylight, the weather was clear, and the two-lane roadway was dry. One student was seriously injured, one sustained moderate injuries, and the other 20 had minor injuries; the schoolbus driver was not injured. None of the bus occupants were ejected from the schoolbus.

The National Transportation Safety Board determines that the probable cause of the accident was the inattention of the 17-year-old student schoolbus driver to his driving task which resulted in the schoolbus leaving the road, loss of control, and a subsequent overturn of the schoolbus. Contributing to the accident was the distraction of the driver by the unruly behavior of the student passengers. Contributing to the severity of the accident was the lack of a guardrail to redirect errant vehicles away from the steep embankment.

INVESTIGATION

The Accident

About 12:10 p.m. on March 13, 1985, a 1980 Ashe County School District schoolbus, driven by a 17-year-old student driver and carrying 22 students ages 16 and 17, departed Northwest Ashe High School for a 9-mile trip to the Ashe County Career Center in Jefferson, North Carolina, which is located in a valley of the Appalachian Mountains. The student driver stated that the students were louder than usual when he started his route and that they became even louder as the trip progressed. He said some students singled out and piled on top of other students in a game called "pile on." The driver said that he attempted to "sling" the students back into their seats by turning the steering wheel sharply as he turned left onto State Route (SR) 88 at the intersection of SR 194 and SR 88. A motorist traveling behind the schoolbus at the intersection stated that the schoolbus made "a very fast abrupt left turn and almost turned over," and that several passengers were running within the bus and waving through the rear windows.

A short time later, about 1/2 mile after the sharp left turn, the schoolbus was traveling up an 8-percent grade on eastbound SR 88 when it went off the right edge of the road at a moderate left curve and crossed the grassy shoulder; the 1980 schoolbus then rolled one revolution to the right and down a steep embankment, and came to rest upright 24 feet below the road surface against two trees. It was daylight, the weather was clear, and the two-lane roadway was dry. (See figure 1.) One student was seriously injured, one sustained moderate injuries, and the other 20 had minor injuries; the schoolbus driver was not injured. There was no fuel leakage or fire.

The student driver said that he was looking into the rearview mirror at the students at the time of the accident because he was concerned about one of the passengers involved, and that he did not know he was in the curve when he went off the road. He said that he attempted to steer to the left but was not successful.

One of three other student schoolbus drivers traveling on the bus and seven other students admitted that they were involved in the game of "pile on" just before the accident. Eight students reported that they saw the driver look into the rearview mirror just before the accident. Two students recalled the driver telling the students to "sit down and behave" or "calm down" shortly before the accident occurred. None of the students verified the swerving motion of the bus at the intersection to "sling" the students back into their seats.

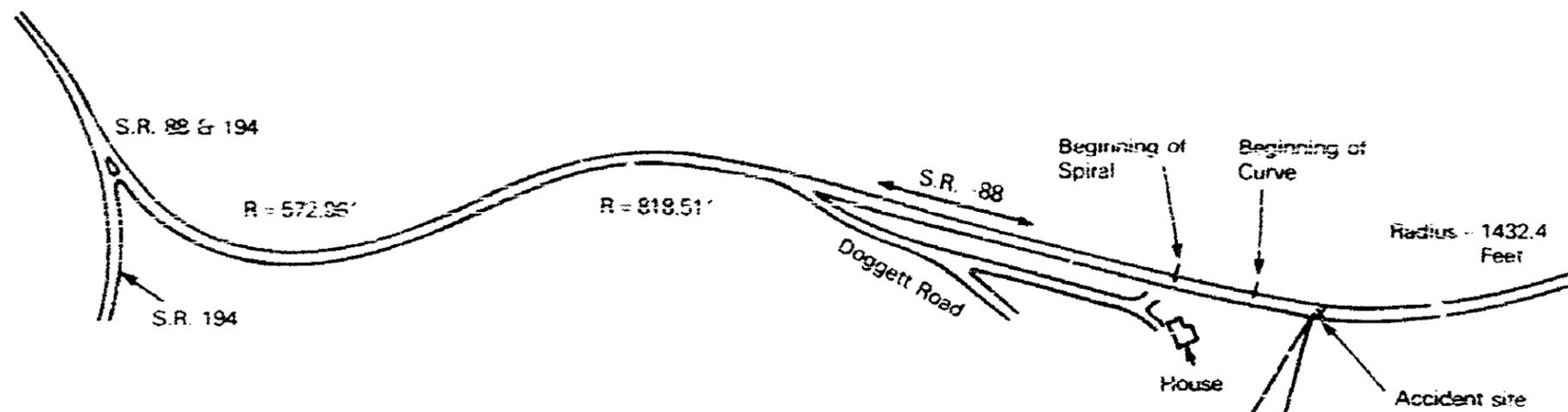
Emergency Response

After the bus came to rest, the passenger seated in the first row right aisle seat, who also was a student schoolbus driver, exited the bus through the front windshield and went to a nearby business establishment. He called the local school district emergency number and reported the accident to the Supervisor of Transportation at the school garage.

The North Carolina Highway Patrol (NCHP) communications center received a call and notified Ashly Ambulance Service at 12:25 p.m. Two ambulances arrived at the scene at 12:27 p.m., the NCHP arrived at 12:28 p.m., and a rescue squad and another ambulance were requested at 12:30 p.m. A command post and a triage center were set up at the site. Because the right front entrance door of the bus was blocked by dirt scooped up by the bus as it came to rest, most of the students exited the bus through the rear emergency door, or through the broken windshield; most had exited before help arrived. (See figures 2 and 3.)

Vehicle Damage

Damage to the schoolbus was minimal. The front, rear, and entire left side were undamaged except for minor scrapes, dents, and creases over the windshield and rear panels. The roof had numerous small, thin scratches and several large dents. On the right side, there were creases over the front right door and two large dents near the roofline above the fourth and sixth windows extending vertically down the side of the bus in which tree bark and dirt were imbedded. A narrow 7 1/2-foot-long horizontal scrape mark was found on the right side of the bus below the right rub rail about 20 feet forward of the rear of the bus. The glass was missing from both sides of the windshield, as were windows Nos. 3, 5, and 7 on the left side, and window No. 6 on the right side. According to passengers, the left side of the windshield was smashed during rescue operations after the accident. The rear emergency door was operable after the rollover.



Schoolbus was traveling eastbound from S.R. 194 towards accident site.

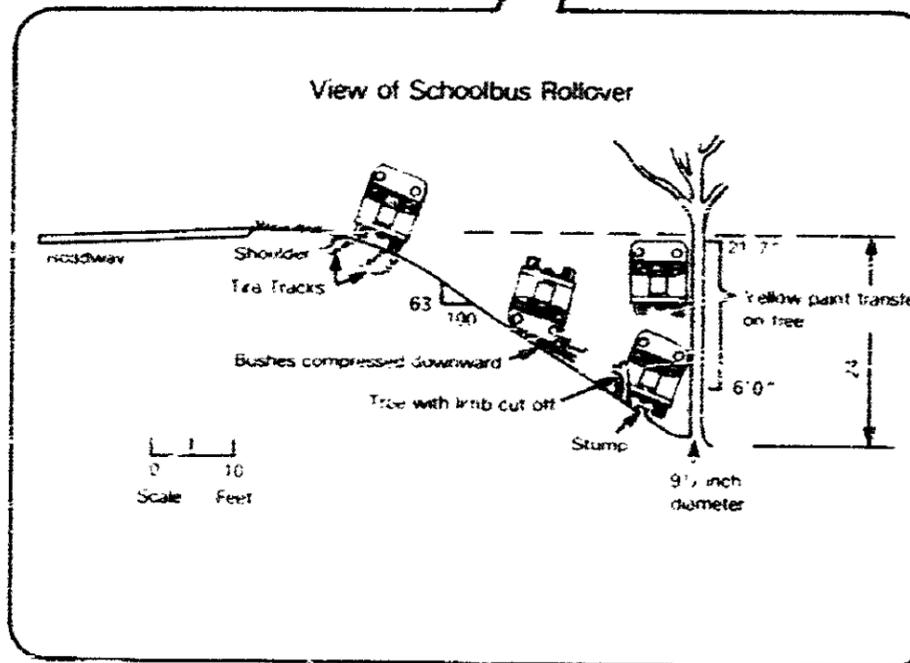
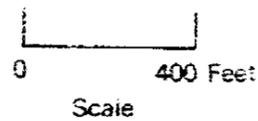


Figure 1.--Plan view of the accident site.



Figure 2.-- Final rest position of the schoolbus.



Figure 3.--Schoolbus rescue operations.

The U-bolt on the left rear leaf spring suspension assembly was deflected 5 inches upward and slightly inward. The left rear shock absorber and the muffler system had several scrapes and the bottom of the fuel tank was marked with superficial smudges. The left rear tires were ripped and the rims were bent; both front tires and the right rear tires were undamaged.

There was no intrusion into the passenger compartment and no separation of the interior body panels. Numerous scrapes and dents were evident inside the schoolbus along the roof and walls. One dent was found on the left sidewall just above the window at the driver's seat. Three seatbacks (at seats No. 5 and No. 6 on the right of the bus and seat No. 6 on the left of the bus) were displaced forward 4 to 7 inches. Two seat cushions (at seat No. 2 on the right of the bus and seat No. 8 on the left of the bus) were missing from their frames, and two seat cushions (at seats No. 7 and No. 9 on the right side of the bus) were misaligned on their frames. Some seat cushions were displaced by emergency personnel during rescue operations in order to remove some of the larger students. All seatleg and sidewall anchorages were intact. Dirt and glass littered the floor and seats near the front of the bus.

After the accident, the rear bumper was pulled outward and the bus was driven about 3 1/2 miles from the accident site to the Ashe County Career Center.

Driver Information

The 17-year-old student schoolbus driver held a valid North Carolina driver's license issued on December 27, 1983. No violations or accidents were listed on his driving record. The driver passed the schoolbus driver written test administered by the North Carolina Motor Vehicle Administration with a grade of 88 percent on March 8, 1984, completed his road test in a schoolbus on June 27, 1984, and began employment as a schoolbus driver in September 1984. According to the schoolbus driver, he had no history of any serious illness and he was not taking any medication at the time of the accident. School officials described him as a good student.

Since September 1984, the schoolbus driver had completed 102 trips between the Ashe County High School and the Ashe County Career Center. The schoolbus driver was assigned only to the midday bus trip. He departed the high school about 12:10 p.m. each school day, traveled 9 miles to the career center in about 20 minutes, attended classes, and returned to the high school about 2:35 p.m.

Vehicle Information

The 13,400-pound 1980 schoolbus had a Thomas Built body and a Chevrolet chassis. It was owned and operated by the Ashe County School District, had been driven 46,870 miles according to the odometer, and had received its last annual State inspection on July 17, 1984. The nine bench-type seats on each side of the center aisle could accommodate 36 high school students. The two-axle bus was equipped with air-mechanical brakes, a four-speed automatic transmission, power steering, an eight-cylinder gasoline engine, a stoparm on the left side, and a 5 1/2-foot-long white crossing control arm mounted to the right front bumper. The horizontal crossing control arm could be rotated outward by the driver from the front to the right side of the bus to prevent students from crossing in the blind spot directly in front of the bus. Both the stoparm and the crossing control arm are required by the North Carolina School Board of Education. The bus driver's seat was equipped with a lapbelt; the bench-type seats were not.

The postaccident inspection indicated that the fire extinguisher and first aid kit were missing from the storage box and had been reported missing on the report of the last monthly inspection conducted on February 1 and 4, 1985 (Friday and Monday). Two 10-foot-long, 25-pound tire chains were found at the rear of the bus. One chain was secured to the inboard leg of each of the two rear seats.

An examination of 12 other Ashe County schoolbuses by Safety Board investigators disclosed 9 buses without fire extinguishers, 2 buses with inoperable fire extinguishers, and 1 bus with an operable fire extinguisher. Several schoolbuses also had tire chains secured to the rear passenger seat legs. First aid kits were missing from 6 schoolbuses. The Supervisor of Transportation for Ashe County stated that these items often are stolen from the schoolbuses and are not replaced due to the cost involved.

Five certificated schoolbus mechanics and one supervisor are employed by the Ashe County School Board to maintain the 76 Ashe County schoolbuses during the school year.

Highway Information

The accident occurred on eastbound SR 88, a two-lane, undivided, asphalt roadway with a double yellow centerline, and a 55-mph posted speed limit. The roads in the area are narrow, hilly, and have many curves. In the eastbound direction at the accident site, the 23-foot-wide roadway has a 9 1/2-foot-wide grass shoulder on the right, an 8 percent upgrade, a 1,432-foot-radius left curve, and no guardrail. The steep embankment to the right of the roadway has a 63 percent slope. The surface of the roadway, the shoulders, and the pavement markings at the site were in good condition. The roadway was resurfaced in 1982.

Five accidents within about 1/2 mile in either direction of the accident site have been reported during the past 3 years. Three of these were run-off-the-road accidents. According to police records, one accident resulted in two "non-incapacitating" injuries. Before the March 13 accident, only one property damage accident had been reported on this segment of road that appeared to have involved the need for a guardrail. The total property damage for all five accidents was \$7,100.

The steep dirt embankment bordering the eastbound lane at the accident site contained briar bushes, rocks, tree stumps, and a large tree. Two other trees about 9 inches in diameter were located about 54 feet down the slope from the edge of the roadway on the embankment and 24 feet below the roadway. These trees supported the top of the schoolbus when it came to its rest position. Scrape marks and yellow paint transfers were found at a height of about 21 1/2 feet on one of the trees.

Safety Board investigators observed a 29-foot-long and a 21-foot-long dual tire track from the right rear and the left rear tires, respectively, in the grass shoulder at the accident site. The NCHP investigating officer stated that the right rear tire track had been about 70 feet long. The tracks were angled about 10 degrees to the right of the roadway edge. There were no tire or other marks evident on the roadway.

Two schoolbuses were observed by the investigators while on site; they were traveling up the hill at about 20 mph.

There was no barrier on the right side of the roadway to redirect errant vehicles away from the steep embankment. The 1977 "Guide for Selecting, Locating, and Designing Traffic Barriers," which is published by the American Association of State Highway and Transportation Officials (AASHTO), characterizes the following criteria for barriers:

Height and slope of the embankment are the basic factors in determining barrier need for a fill section (an embankment that slopes downward). Warranting criteria for fill sections are shown in Figure III-A-1. The criteria are based on studies of the relative severity of encroachments on embankments versus roadside barriers. Embankments with slope and height combinations below the curve do not warrant protection. Obstacles on the slope may, however, warrant protection. Embankments with slope and height combinations above the curve warrant protection. (See figure 4).

Injuries

<u>Injuries</u>	<u>Driver</u>	<u>Passengers</u>	<u>Totals</u>
Fatal	0	0	0
Critical	0	0	0
Severe	0	0	0
Serious	0	1	1
Moderate	0	1	1
Minor	0	20	20
None	1	0	1
Total	1	22	23

Medical and Pathological Information

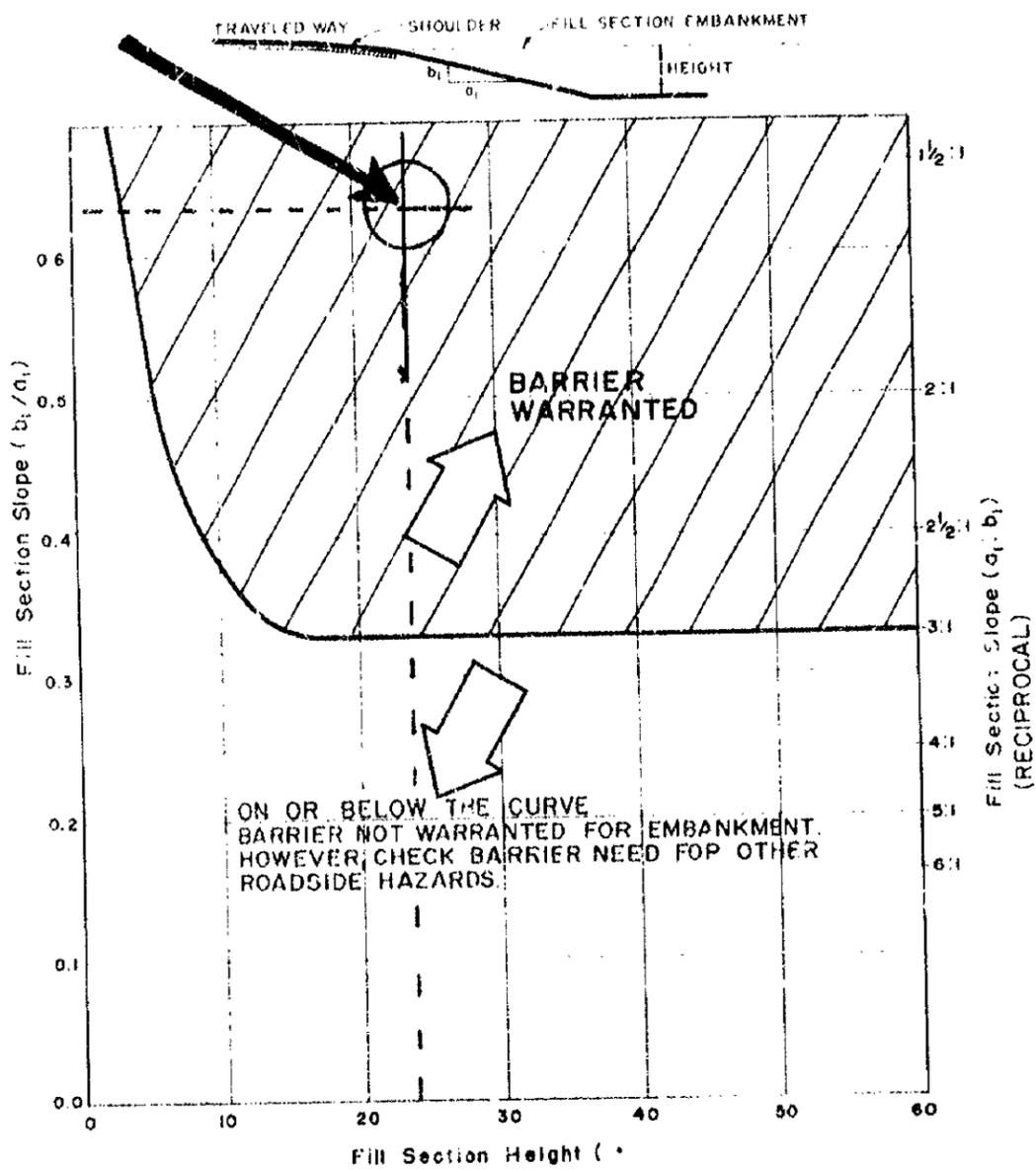
None of the 16- to 17-year-old bus passengers were ejected from the schoolbus. The most seriously injured bus passenger, who was in the right rear window seat (Row 9), sustained a bruised liver (AIS-3). ^{1/} The bus passenger in the fifth row window seat on the right had moderate injuries, including a fractured left clavicle (AIS-2). The other 20 bus passengers received minor injuries (AIS-1), including multiple contusions, abrasions, fractures, and lacerations to the extremities. (See figure 5 for passengers' seating position and injury details.) Although not required by North Carolina State law, the student schoolbus driver was wearing his lapbelt and was not injured in the accident. Fifteen of the 22 bus passengers were seated on the right side of the bus.

Most students did not remember what they struck or what caused their injuries. The student seated in the fifth row window seat on the right side of the bus who sustained a broken clavicle (AIS-2) believed she received her injury when she struck the bus floor. The most seriously injured student (AIS-3), seated in the ninth row window seat on the right, did not know what she struck or how she received her bruised liver. The remaining 20 passengers received minor injuries (AIS-1), but only a few could identify what they had struck. Some students mentioned that they struck the roof, windows, and seatbacks (two mentioned striking the metal bar inside the seatback cushion) and that other students fell on them. One student seated in the first row recalled that his feet hit the windshield, and another also seated in the first row stated that his right arm struck the bar connected to the front door handle (he received a bruise).

Schoolbus Driver Operation

Ashe County, population 19,571, owns and operates 76 schoolbuses and services 10 schools. The local school district employs 35 student schoolbus drivers and 42 adult

^{1/} American Association for Automotive Medicine: Abbreviated Injury Scale, 1980.



METRIC CONVERSION
1 ft = 0.305 m

Fig. III-A-1. Warrants for Fill Section Embankments.

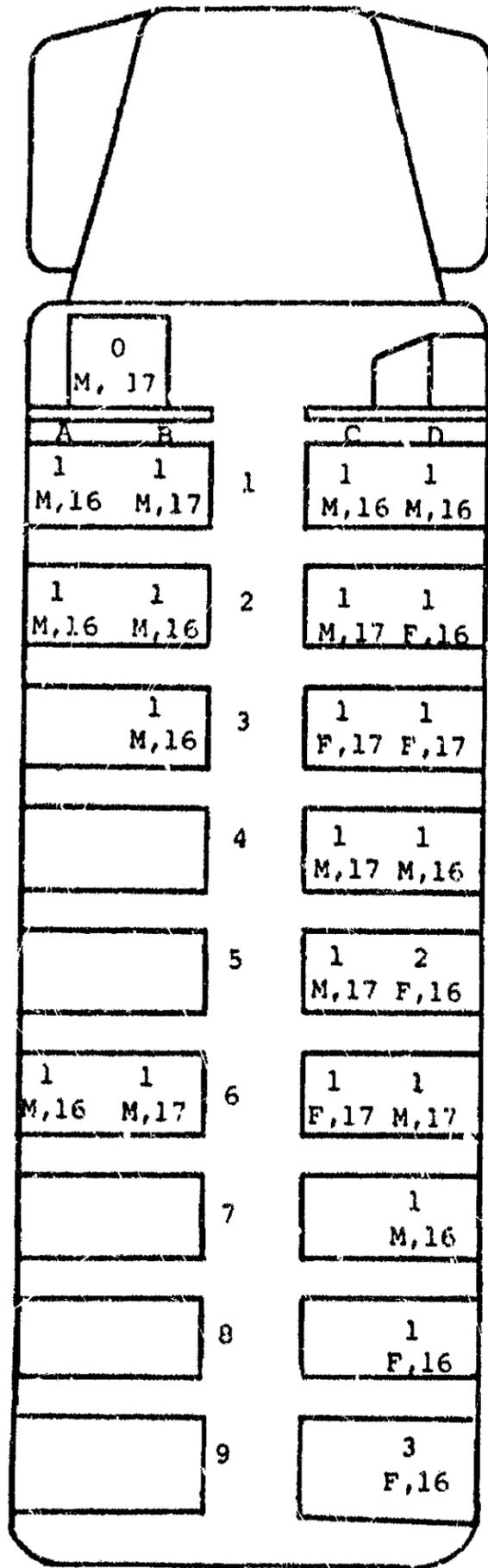
Figure 4.--Criteria for guardrail.

Left Side of Bus

- 1-A Multiple contusions on head and chest
- 1-B Contusion on right arm
- 2-A Left side - black eye, abrasion on elbow, contusion on knee; right side - contusion on shoulder and lower part of leg
- 2-B Fractured nose, contusions on chest and right shoulder, abrasions on back and face
- 3-B Contusions on right leg and abrasions on right side of face
- 6-A Abrasion on right arm, sprained finger, contusion on right leg
- 6-B Minor contusion on back of head

Right Side of Bus

- 1-C Contusion on lower left thigh
- 1-D Contusions on chest and back
- 2-C Contusions on both legs
- 2-D Contusions and abrasions to lower legs and ankles, mild concussion
- 3-C Contusions on back and head, scratch under left eye
- 3-D Contusion on left shoulder and abrasion on right arm
- 4-C Contusion on right hip and left shoulder, scratch on right eye lid
- 4-D Contusions on right arm, abrasions on both sides of hip
- 5-C Abrasions on right side under arm and right elbow, Contusion on left leg
- 5-D Fractured left clavicle, contusions on legs, head, and hip
- 6-C Left knee sprained and contused
- 6-D Fractured nose, laceration above left eye
- 7-D Contusions on back of head, both shoulders, lower back, abrasions on head, left elbow, left shoulder
- 8-D Contusions on right arm and leg, laceration on left side of head
- 9-D Contusions on forehead, hips, back, legs, left ankle, and liver and intestines



LEGEND

AIS*	SEVERITY
0	No Injury
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Maximum Injury (Virtually Unsurvivable)

*American Association for Automotive Medicine: Abbreviated Injury Scale

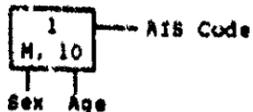


Figure 5.--School seating and injury diagram.

(nonstudent) schoolbus drivers. ^{2/} Between 1982 and 1984, 26 schoolbuses were involved in 25 accidents in Ashe County (one accident involved two schoolbuses). Ten, or 40 percent, of these accidents were run-off-the-road accidents, and fifteen, or 60 percent, involved 16- and 17-year-old schoolbus drivers. For the 1984-1985 Ashe County school year, there were four 16-year-old drivers, twenty-one 17-year-old drivers, ten 18-year-old drivers, and forty-two over 18-year-old drivers. Of the students involved in the "pile on" game, two were scheduled to start schoolbus training a month after the accident, and one was qualified as a student schoolbus driver.

Training

Prospective student and adult schoolbus drivers in North Carolina receive the same training. Schoolbus drivers are given an average of 10 hours in-service training annually by the State Department of Motor Vehicles. The major topics taught and listed in the training manuals and in the Handbook for School Bus Drivers are:

1. Schoolbus driver requirements--including the personal (high moral character), physical, visual, hearing, mental, and legal requirements.
2. Administration of pupil transportation--including the duties of the driver, operating on schedule, passenger conduct, and maintaining records.
3. Natural and man-made laws--including friction, gravity, centrifugal force, loading procedures, schoolbus stop laws, following too close, and speed laws.
4. Schoolbus accidents--including first aid and evacuation of the schoolbus.
5. Defensive driving--including the effects of weather, lighting, road conditions, traffic volume, vehicle condition, and pupil misbehavior.
6. Safe driving procedures--including the inspection of buses for emergency equipment, maneuvering through railroad crossings and intersections, and right-of-way laws at intersections.

Those schoolbus drivers who are assigned schoolbuses are each given a copy of the handbook and told that it is to be kept in the schoolbus at all times.

Fifty-five percent of the North Carolina schoolbus drivers are student drivers. A student is eligible to become a schoolbus driver if he or she fits the following criteria:

1. Is a minimum of 16 1/2 years of age.
2. Possesses a valid North Carolina driver's license (either A, B, or C) and has 6 months driving experience as a licensed motor vehicle operator.
3. Has not been convicted of a moving traffic violation or charged in connection with a traffic accident during the 6 months immediately preceding certification.

^{2/} For purposes of this discussion, drivers 18 years old and above are considered "adult" drivers, whether they are "students" or not.

4. Passes a written test and a road test administered by the North Carolina Department of Motor Vehicles following 2 days of classroom instruction and a minimum of 2 days of behind-the-wheel instruction.
5. Passes a 48-hour driver education program administered by the local Board of Education.
6. Passes an annual physical examination given either by the local health department or by a private physician.
7. Is approved by the local School Principal, Supervisor of Transportation, Superintendent of Schools, and Board of Education.

Evacuation Drills

The North Carolina State Board of Education has adopted the Federal guidelines issued by the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) Highway Safety Program Standard (HSPS) 17, Pupil Transportation Safety. According to HSPS 17, schoolbus emergency evacuation drills should be held during the first week of each school semester. However, there are no procedures in place which allow the State School Board to check with the local school districts to ensure that the guidelines are implemented and followed. While emergency evacuation procedures are addressed in the "Teacher's Guide for School Bus Passenger Safety," the "School Bus Driver Instructional Program Instructor's Manual" and the "Handbook for School Bus Drivers," Northwest Ashe High School does not conduct schoolbus emergency evacuation drills.

Discipline

The North Carolina "School Bus Driver Instructional Program Instructor's Manual" states, in part:

The first and most important step in handling a discipline problem is to stop the bus in a safe place. Once the bus is stopped, restore order, if possible. The inside rearview mirror is not to be used to correct a discipline problem. You cannot watch the mirror and the road at the same time, and you endanger your students' lives by attempting to do so.

Also the manual addresses the use of monitors. 3/ If a schoolbus driver requests a monitor on the bus, the principal has the authority to appoint one. In general, monitors are unpaid volunteers. There are provisions in the Public School Laws of North Carolina (115C-245) for paid safety assistants hired by the local school district upon recommendation of the principal through the local superintendent. According to the law:

3/ The "Handbook for Schoolbus Driver's" defines a monitor as follows: The school bus monitor assists the driver. This aid can be given in maintaining passenger discipline, in checking the tracks at railroad grade crossings, in checking to the rear when it is necessary to back the bus, and in loading and unloading the bus, especially during an emergency evacuation.

The safety assistants thus employed shall assist the bus drivers with the safety, movement, management, and care of the children boarding the bus, leaving the bus, or being transported in it. The safety assistant should be either an adult or a certified student driver who is available as a substitute bus driver.

In practice, however, monitors are not used and safety assistants are used only in transporting handicapped or exceptional children. According to the principal, no previous discipline problems had been reported by this schoolbus driver.

In one Ashe County schoolbus accident, which occurred on June 1, 1984, the 18-year-old schoolbus driver was stopping the schoolbus "in order to restore order on the bus" when the schoolbus was rear-ended by a station wagon. In Craven County on October 17, 1985, a 17-year-old schoolbus driver was distracted by a student passenger, causing the schoolbus to run off the right side of the road and strike a culvert and several other objects at two residences.

The Highway Safety Program Manual for HSPS 17, Pupil Transportation Safety, addresses the issue of schoolbus discipline. Under "Driver Selection," it states that "School vehicle drivers should be in good physical condition, of good character, skilled in the operation of their vehicles and in personal relationships with the children they carry." Under "In-Service Training," it states that "Special problems created by railroad crossings, blind intersections, interstate highways, pupil behavior, and skill improvement should be the basis for [course] content." Under "Pupil Instruction," the manual states that:

... pupils who are knowledgeable about the rules for bus riders are more easily accountable for their behavior and reduce the need for adult or student monitors. Good student behavior permits the school bus driver to give all his attention to the driving task. Students whose behavior threatens the safety of all aboard should be denied transportation until their behavior becomes acceptable.

Under "Pupil Instruction," the manual states that "at least twice during each school year, each pupil who is transported in a school vehicle shall be instructed in safe riding practices, and participate in emergency evacuation drills." (See appendix B.)

Routing

Schoolbus routing is the responsibility of the school principal. The accident route to the Ashe County Career Center was one of two possible routes. The other route would have involved travel through a congested urban area on terrain similar to the accident vicinity. More than seven other schoolbuses travel round trip by way of the accident route each day.

Safety Standards

Schoolbuses manufactured after April 1, 1977, are required to meet Federal Motor Vehicle Safety Standard (FMVSS) 220, Schoolbus Rollover Protection. FMVSS 220 requires that: (1) that when a force equal to 1 1/2 times the unloaded vehicle weight is applied to the roof of the vehicle's body structure through a force application plate, the downward vertical movement at any point on the plate shall not exceed 5 1/8 inches, and (2) each emergency exit shall be capable of opening after the test conditions are applied.

Also, schoolbuses manufactured after April 1, 1977, must comply with FMVSS 221, 222, and 301. FMVSS 221, Schoolbus Body Joint Strength, requires that both inside and outside panels of schoolbuses be fastened to other parts and to each other by joints which have at least 60 percent of the strength of the metal of the thinner panel which is joined. The purpose of this standard is to prevent separation of the exterior and interior panels that form part of the schoolbus body.

FMVSS 222, Schoolbus Passenger Seating and Crash Protection, establishes occupant protection requirements for schoolbus seating and restraining barriers for buses. None of the seatbacks may be displaced more than 10 inches aft or 14 inches forward during the application of the specified test forces. The purpose of this standard is to reduce the number of deaths and injuries resulting from the impact of schoolbus occupants against seat structures and barriers within the vehicle during crashes and sudden driving maneuvers.

FMVSS 301, Fuel System Integrity, establishes fuel system requirements for large schoolbuses. The purpose of this standard is to reduce deaths and injuries occurring from fires that result from spillage during and after crashes.

ANALYSIS

The Accident

The weather, the roadway, and the mechanical condition of the schoolbus were not causal factors in this accident. The evidence indicates that a lack of passenger discipline was a factor. The schoolbus driver, the passengers, and the motorist who saw the schoolbus before the accident stated that some of the passengers were moving around on the bus while it was in motion. The schoolbus driver stated that he was distracted by a game the passengers were playing and was concerned about one of the passengers involved. Rather than stop the bus on the side of the road to establish order, the student schoolbus driver tried to drive and maintain discipline at the same time. First, he verbally warned the students to behave and then he tried to "sling" the students back into their seats. Finally, as he was watching the students in the rearview mirror, he drove off the side of the road.

The physical evidence (i.e., the tire tracks made by the bus) indicates that the bus driver held the steering wheel straight rather than turning to the left as the road curved left. Then the bus driver inadvertently drove onto the right shoulder and was unable to regain control while on the shoulder. Because of the instability of the bus due to the steepness of the embankment adjacent to the shoulder and the predominant passenger loading on the right, the bus rolled to the right. There was no corrective maneuvering that could have been performed to regain control after the schoolbus was on the embankment. Consequently, the continuing efforts of the schoolbus driver to steer the bus back onto the roadway were futile.

The maximum speed at which this particular bus could climb the 8 percent grade was calculated to be 22.8 mph in second gear. This speed is close to the speed of two buses subsequently observed climbing the hill. It was calculated that the speed at overturn was less than 5.6 mph. However, it also was calculated that the bus rolled laterally due to gravity at a speed of about 10 to 12 mph, struck the trees, accelerated again due to gravity, and landed at a speed of 15.5 mph. There was no evidence to indicate that the driver braked the bus prior to overturn.

The slope of the embankment (63 percent) and the fill height (24 feet) are indicated in figure 4, which shows that the curve and embankment at the accident site falls above the curve in the chart and would have warranted a barrier according to the AASHTO guidelines. The Safety Board believes that because the schoolbus was traveling at such a slow speed at the point of overturn, a guardrail would have retained and either stopped or redirected the schoolbus before it rolled over. The Safety Board realizes that the hilly topography in the accident vicinity is such that the installation of guardrail or other barrier system at all locations where the height/slope criteria are met is not feasible. This location had no previous accident record that should have alerted highway officials to the need for a barrier. Because this rollover accident could have been prevented, and because seven or more schoolbuses travel this route round trip per day, the Safety Board believes that a guardrail is warranted at the accident site and should be installed by the North Carolina Department of Transportation.

Emergency Equipment and Evacuation

The Safety Board's postaccident inspection of the accident bus revealed that the fire extinguisher and the first aid kit were missing and were not available at the accident site. Because of missing and/or inoperable fire extinguishers and first aid kits in several other Ashe County schoolbuses, the Safety Board believes that the practice of checking safety equipment during the monthly inspections may not be taken seriously in the school district. The Safety Board believes that Ashe County and other North Carolina school districts should replace the missing or inoperable fire extinguishers and first aid kits in their schoolbuses promptly and insure that these items are properly maintained.

The Safety Board also believes that Ashe County and other North Carolina school districts should place additional emphasis on thorough and timely monthly maintenance inspections of schoolbuses. Since the last recorded monthly inspection of the accident schoolbus was conducted on February 1 and 4, 1985, it is possible that the monthly inspections are not being conducted every 30 calendar days as required. Also, the missing fire extinguisher and first aid kit on the accident bus, which had been reported in the last recorded monthly inspection, and the presence of heavy uncontained tire chains attached to rear seat legs indicate that potential safety hazards are not being recognized and rectified by Ashe County and perhaps other North Carolina school districts during the monthly inspections.

Although no difficulty was reported with the emergency evacuation of the accident schoolbus, the failure to conduct emergency evacuation drills in this school district could have had serious safety consequences in another accident situation. The Safety Board believes that Ashe County and other North Carolina school districts should comply with the emergency evacuation drill procedures recommended in Highway Safety Program Standard 17 and adopted by the State of North Carolina.

Discipline

The North Carolina "Handbook for School Bus Drivers" states that if there is a problem on the bus, the driver should pull to the side of the road and maintain order before continuing on. The student driver involved in the accident could have pulled over to the right shoulder at the intersection of SR 194 and SR 88 instead of attempting to "sling" the students back into their seats. He also could have pulled over to the right shoulder at the bottom of the hill on which the accident occurred or at any other location.

One possible explanation for the schoolbus driver's failure to maintain discipline was his age relative to the passengers. The 17-year-old bus driver, an adolescent, was charged with the responsibility of both driving the bus safely and maintaining order and discipline among passengers who were his peers. None of the passengers on the schoolbus, even those who were not involved in playing the game of "pile on," would admit that the schoolbus driver made an abrupt turn to sling the students back into their seats. Also, the majority of the students did not pay attention to the student driver and did not recognize him as a person in authority. It is very likely that the student driver was unable to discipline the passengers effectively because of the typical adolescent group pressure to conform and because he had no special training to combat these peer pressures. Student schoolbus drivers in North Carolina receive no special training in disciplining their adolescent peers.

The Safety Board has found that maintaining discipline on schoolbuses may be a serious distraction for adult schoolbus drivers as well as adolescent schoolbus drivers. For example, in its investigation of a Miami, Florida, schoolbus loss of control accident on September 28, 1983, 4/ the Safety Board found that "the driver (an adult) initiated a sudden steering maneuver when she was distracted, which caused the rear end of the bus to become unstable." The Safety Board determined that "Contributing to the accident was the busdriver's distraction from her driving duties by an unruly student passenger."

In the Safety Board's investigation of a schoolbus/freight train collision on April 12, 1984, in Carrsville, Virginia, 5/ documented evidence of student misbehavior was included in the Board's report along with reports from the bus driver's husband, friends, and co-workers that "the driver (an adult) was experiencing difficulty in keeping order among the elementary school-aged children on her current route." The school principal reported that the driver in that accident had come to him at least once a week with disciplinary problems, and, in some cases, the driver had gone directly to the parents of some of the children on her route. Several passengers on the driver's route reported that "she stopped the bus almost daily to discipline the children." In that investigation, the Safety Board found that "the lack of student discipline on the bus was a problem and the noise level in the bus may have interfered with the driver's ability to hear the whistle of the approaching train."

The purpose of Federal guidelines in pupil transportation safety is to reduce, to the greatest extent possible, the danger of death or injury to students being transported to and from school. Because student behavioral problems have been recurring contributory factors in the Safety Board's schoolbus accident investigations and because this problem has a definite bearing on driving a schoolbus in a safe, careful manner, the Safety Board believes the National Highway Traffic Safety Administration particularly should encourage school jurisdictions to comply with the portions of HSPS 17 and the program manual for HSPS 17 addressing the handling of student behavior problems. The training of schoolbus drivers and instruction of students in the rules for bus riders, enforcement actions to be taken for rule violations, and the need for students to practice good behavior at all times while riding on schoolbuses needs recurrent emphasis.

4/ Highway Accident Report--"Schoolbus Loss of Control Accidents in Miami, Florida, September 28, 1983, and Birmingham, Alabama, April 12, 1984" (NTSB/HAR-85/03).

5/ Highway Accident Report--"Collision of Isle of Wight County, Virginia, Schoolbus with Chesapeake and Ohio Railway Company Freight Train, State Route 615 near Carrsville, Virginia, April 12, 1984" (NTSB/HAR-85/02).

Use of Student Schoolbus Drivers

A 1974 University of North Carolina report 6/ which analyzed schoolbus accidents in North Carolina for the 1971-1972 school year by driver age concluded that:

...there was a significant difference between drivers age 16 through 20 and those age 21 and older, with the younger drivers having a higher accident rate. However, it was further found that it was the 16-year-old drivers accounting for this high rate. There were no significant differences between the accident rates of drivers age 17 through 20 and those 21 and older. Because further analyses indicated that the poor performance of the 16-year-old driver is probably attributable to their inexperience, it is recommended that increased attention be given to the selection and training of these beginning drivers.

The report also recommended that school districts "license more schoolbus drivers at age 17 rather than at age 16, provided they have had a full year driving experience at that time."

A 1980 University of North Carolina study 7/ of 61 schoolbus accidents in three North Carolina counties for the school years 1977 through 1979 concluded that:

...driving left of center crashes involved high school age bus drivers exclusively. On a statewide basis, younger drivers are also overrepresented in this crash type, though not so dramatically. It is recommended that, during the more individualized on-the-road phase of initial training, younger drivers receive both special emphasis on the hazards of driving left of center and on ways to avoid doing so in potential conflict situations.

Finally, a 1982 report 8/ issued by NHTSA states that "Recent increases in schoolbus crashes and pupil fatalities attributed particularly to the 16- and 17-year-old schoolbus drivers have raised questions about continuing to employ them as schoolbus drivers." Several conclusions drawn in the report are listed below:

- o During the last 10 years, the States have decreased the use of 16- and 17-year-old schoolbus drivers by 6 percent.
- o Because the annual miles driven by 16- and 17-year-old drivers is nearly the same as the annual miles driven by 18-year-old and older drivers, exposure would not account for the difference in accident experience.
- o In the few States where they are employed, 16- and 17-year-old drivers have both more accidents per million miles and more accidents per driver than 18-year-old and older drivers.

6/ Judith McMichael, "School Bus Accidents and Driver Age," Highway Safety Research Center, University of North Carolina, December 1974.

7/ Robert B. Daniel, John H. Lacey, Beverly T. Orr, "Investigations of 61 School Bus Crashes in Three North Carolina Counties," Highway Safety Research Center, University of North Carolina, January 1980.

8/ David H. Soule, "The 16/17 Year Old School Bus Driver," Office of Driver and Pedestrian Safety, National Highway Traffic Safety Administration, U.S. Department of Transportation, April 1982.

Of the 25 Ashe County schoolbus accidents in the 1982-1984 school years, 15 involved drivers who were 16 or 17 years old. In 7 of the 15 accidents, the 16- and 17-year-old drivers were charged with a traffic violation. In 6 other accidents the driver appeared to be at fault, but no charges were indicated on the accident report. In the 10 schoolbus accidents involving drivers 18 years old and above, 4 drivers were charged with violations and 3 drivers appeared to be at fault, but no charges were indicated. Although this is a small sample, adolescent schoolbus drivers (16 and 17 years old) in Ashe County seem to be at fault in more accidents or charged more often than older drivers.

On January 14, 1983, at 3:20 p.m. in Jacksonville, North Carolina, a 17-year-old student schoolbus driver was stopped at a grade crossing awaiting an approaching freight train when the driver decided to back the bus away from the tracks. She mistakenly put the schoolbus in forward gear instead of reverse and the vehicle lunged forward into the path of the train. The left side of the schoolbus was struck broadside by the train, injuring 32 of the 56 students.

A comparison was made of the proportion of schoolbus accidents in North Carolina to million miles driven for 16- and 17-year-old drivers and for 18-year-old and older drivers for each of the school years 1982-1983, 1983-1984, and 1984-1985 (See table 1.) The accident rate per million miles for 16- and 17-year-old drivers was 12.7 for 1982-1983, 14.0 for 1983-1984, and 13.2 for 1984-1985. The accident rate per million miles for 18-year-old and older drivers was 8.1, 10.0, and 9.2, respectively. The differences in accident rates per million miles are highly significant for all three years for the two age groups ($P < .0001$). ^{9/} In all 3 years, the 16- and 17-year-old schoolbus drivers had a statistically significant greater proportion of accidents per million miles than schoolbus drivers 18 years and older. ^{10/}

To learn whether the accident rates of 16- and 17-year-old schoolbus drivers experienced in North Carolina prevailed in other States, the Safety Board contacted the Department of Labor (DOL). Any State which employs 16- and 17-year-old schoolbus drivers must apply for an annual exemption from DOL "Hazardous Occupations Order No. 2," which became effective on September 10, 1968. The purpose of this child labor regulation is to raise the age of employment from 16 to 18 years in those occupations declared to be particularly hazardous. (See appendix C.)

Ten States have applied for exemption from the order. ^{11/} Nevada filed for the exemption, but lists no current 16- and 17-year-old schoolbus drivers. Alabama, Mississippi, South Carolina, and North Carolina employ the bulk of the adolescent student schoolbus drivers. These four States employ 7,733 adolescent student schoolbus drivers

^{9/} $P < .0001$ -- Probability is less than 1 in 10,000 that the differences observed could have been obtained by chance alone.

^{10/} These results were corroborated by a comparison of the number of schoolbus accidents by driver age for the two age groups. The proportion (or the ratio) of accidents for the 16- and 17-year-old group to the total number of 16- and 17-year-old schoolbus drivers was 0.108 for 1982-1983, 0.121 for 1983-1984, and 0.108 for 1984-1985. The proportion of accidents for the 18-year-old and older group to the total number of 18-year-old and older drivers was 0.069 for 1982-1983, 0.086 for 1983-1984, and 0.082 for 1984-1985. The difference in the proportion of accidents between the age groups was 0.039 for 1982-1983, 0.035 for 1983-1984, and 0.026 for 1984-1985. The difference in the proportion of accidents per driver for the two age groups for the 3 years tested is highly significant statistically.

^{11/} U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division, "Accident Data on Schoolbus Drivers Annual Report" 1983-1984.

Table 1. -- North Carolina schoolbus accidents by driver age for the school years 1982-83, 1983-84, and 1984-85.

SCHOOL YEAR	NUMBER OF SCHOOLBUS DRIVERS				NUMBER OF SCHOOLBUS ACCIDENTS	
	16- AND 17-YEAR-OLDS	MILEAGE	18-YEAR-OLD AND OLDER	MILEAGE	16- AND 17-YEAR-OLDS	18-YEAR-OLD AND OLDER
1982 - 1983	4,599	39,330,279	8,160	69,920,497	458	567
1983 - 1984	4,580	39,452,462	8,245	71,058,636	552	709
1984 - 1985	4,605	36,929,811	8,345	74,978,706	486	691

and 21,252 adult schoolbus drivers who drive a total of 72,072,061 and 192,447,139 annual miles, respectively. (See table 2.) The adolescent student drivers in the four States attend the same schoolbus driver training program as the adult schoolbus drivers. For the 1983-1984 school year, there were 1,749 accidents involving 18-year-old and older schoolbus drivers and 1,161 accidents involving 16- and 17-year-old schoolbus drivers. The five other States (Wyoming, Oklahoma, Nebraska, Iowa, and Virginia) collectively list 98 adolescent student schoolbus drivers with 110 accidents reported for the 1983-1984 school year.

A comparison, based on the difference of proportions test using the Z statistic, was made of the accident rate per million miles driven for the two age groups for the combination of the four States shown in table 2. The number of accidents per million miles driven in the four States is 16.1 for 16- and 17-year-old drivers and 9.1 for drivers 18 years and older. The difference in accident rates per million miles driven by age group is highly significant statistically ($P < .0001$). The State of Alabama lists seventy 16- and 17-year-old schoolbus drivers driving 49,163 activity trip miles and 651,510 regular route miles in the 1983-1984 school year. The Safety Board has investigated many activity trip accidents and believes that the amount of activity trip miles driven by the inexperienced 16- and 17-year-old schoolbus drivers in Alabama is extremely high. The Safety Board also believes that the amount of regular routes driven by the inexperienced 16- and 17-year-old schoolbus drivers in South Carolina is high.

Based on the accident experience of 16- and 17-year-old schoolbus drivers in North Carolina, South Carolina, and Alabama, and the results of previous North Carolina reports and studies, the Safety Board believes that these three States should discontinue the practice of hiring 16- and 17-year-old schoolbus drivers.

In evaluating the application of a State for an exemption for schoolbus driving the Secretary of the Department of Labor considers the following criteria: 12/

1. Whether the accident experience of schoolbus drivers under 18 years of age in the States, if any are employed, compares favorably with that of adult schoolbus drivers.
2. Whether schoolbus drivers are selected by the school principal and approved by the county superintendent or an official of equivalent responsibility.
3. Whether schoolbus drivers are required to have completed a State-approved driver education course, or special schoolbus driver training courses prior to being allowed to transport passengers.
4. Whether training and testing of schoolbus drivers includes classroom and behind-the-wheel training and is this done by qualified officials.
5. Whether schoolbus drivers are required to pass a physical examination.
6. Whether the operation of schoolbuses is supervised by the school principal, the transportation or other equivalent officer, and State, county, or city police.

12/ Sec. 3.52, Stat. 1061, as amended: 29 U.S.C. 203.

Table 2.-- Schoolbus drivers by age and schoolbus trip miles for the 1983-84 schoolyear.

STATE	DRIVER AGE: 16 and 17			DRIVER AGE: 18 and Above		
	Number of Drivers	Activity Trip Miles	Regular Route Miles	Number of Drivers	Activity Trip Miles	Regular Route Miles
Alabama	70	49,163	651,510	5,020	3,539,390	46,903,958
Mississippi	20	**	200,000	5,070	**	42,806,746
South Carolina	3,063	283,942	31,434,984	2,917	262,101	27,876,308
North Carolina	4,580	**	39,452,462	8,245	**	71,058,636

* U.S. Department of Labor Statistics - Accident Data on Schoolbus Drivers Annual Report

** Schoolbuses Not Used for Activity Trips

7. Whether schoolbuses are thoroughly inspected a minimum of four times a year at a State, district, or county inspection station and receive maintenance and repairs at regular intervals to ascertain and insure their safe operating condition on a continuous basis, and that all inspections, maintenance, and repairs are performed by qualified inspectors and mechanics.
8. Whether schoolbus drivers are provided with and required to use seat belts.
9. Whether adequate measures are taken by State and local officials to control the speed of school buses in order to insure that the buses are not driven at a speed greater than is reasonable and prudent.
10. Whether adult chaperones, approved by local school authorities, accompany schoolbus drivers on special activity trips sponsored by the school.
11. Whether the schoolbuses conform substantially to the Minimum Standards for School Buses, 1964 Revised Edition, recommended by the National Conference on School Transportation and published by the National Education Association.
12. Any other factor which the Secretary may find relevant in evaluating the application for exemption.

The DOL review process begins 90 days before an exemption expires. A letter is sent to the Governors of all States holding exemptions reminding them to submit their application and current accident data. After receiving a letter from a Governor requesting renewal of the annual exemption, DOL sends a letter to the State granting the exemption. According to the DOL staff, an exemption has never been denied to any State to operate with 16- and 17-year-old schoolbus drivers. The Safety Board was told by DOL staff that several years ago (about 1982) a draft of a denial of exemption was prepared for the State of North Carolina due to the accident data submitted. However, the denial was never made officially. The Safety Board concludes that during the application for renewal of exemptions there is a minimum amount of discussion and research pursued by the DOL staff to ensure compliance with the established criteria.

Schoolbus Body Rollover Protection

The only damaged areas on the exterior roof sheet metal were a few minor dents which occurred when the roof contacted the ground and other obstacles during the rollover. The schoolbus performed in a crashworthy manner with respect to the requirements of FMVSS 220. The roof reacted to the crash forces as a unit, and the schoolbus body retained its basic shape which provided survivable occupant space. The rollover did not deform the emergency door or its frame whatsoever.

Schoolbus Body Joint Strength

Because none of the exterior and interior body panels separated, the Safety Board concludes that the schoolbus body met the requirements of FMVSS 221 and that schoolbus body crashworthiness has been improved because of this standard.

Schoolbus Passenger Seating and Crash Protection

FMVSS 222 provides for schoolbus occupant crash protection, primarily for frontal and rear-end collisions, through the use of strengthened, properly spaced, padded seatbacks and padded restraining barriers. Although the passengers were tossed around within the bus and were not contained within their seating positions as the bus rolled over, only two of the passengers received more than minor injuries. Many students struck the unpadded roof and sidewalls of the bus as evidenced by the dents, scratches, and shoe prints on the interior surface.

None of the seatbacks were displaced to the front or rear by student contact in excess of the requirements of FMVSS 222. However, the padding on the seatbacks apparently was not dense enough to prevent at least two students and probably other students from striking the metal frame bars within the cushion as the bus rolled slowly to the right. The seat leg floor anchorages and the seat bench wall attachments remained intact.

The Schoolbus Fuel Tank

The fuel tank was not damaged during the accident, and there was no leakage of fuel reported after the schoolbus came to rest. The fuel tank met the performance requirements of FMVSS 301.

Survival Aspects

Although the student schoolbus driver was wearing a lapbelt, he struck the left sidewall of the bus just above the window as indicated by the dent in this location. However, he was uninjured. If the driver had not been restrained, he could have been seriously injured by contact with the dashboard, gear shift, windshield, or by a fall into the bus stairwell. The Safety Board has recommended that drivers be required to wear the available lapbelts because they are in a more hostile environment than the student passengers and they need to retain control of the vehicle and to be able to direct evacuation efforts after an accident.

The Safety Board recently has investigated several schoolbus accidents which illustrate the need for drivers to use available restraints. For example, on April 23, 1985, a schoolbus traveling along a country road near Caldwell, Texas, struck a soft dirt embankment and overturned onto its left side. The driver, who was wearing her lapbelt, was not injured in the rollover and was able to direct passenger evacuation efforts. When a schoolbus near Durango, Colorado, did a 90 degree rollover on December 11, 1984, the lapbelted driver sustained two broken ribs, and contusions on her left knee and both ankles from contact with the driver console, however, her injuries would likely have been more serious if she had not been belted. When the bus came to rest on its left side in an icy river, the schoolbus driver was able to direct student evacuation. Lapbelt use by the driver helps reduce the possibility of serious injury or ejection and increases the chances that the driver will be conscious following the crash.

Because of its concern for schoolbus safety, on September 23, 1983, the Safety Board issued the following recommendation to the Governors of the 50 States and 4 Territories and the Mayor of the District of Columbia:

Review State laws and regulations, and take any necessary legislative action, to ensure that drivers of schoolbuses are required to wear their seatbelts whenever the vehicle is in motion, that all schoolbus drivers are made aware of this requirement, and that periodic monitoring of schoolbus driver seatbelt use is conducted (Class II, Priority Action) (H-83-41)

The State of North Carolina has not responded to Safety Recommendation H-83-41. Therefore, it is being held in an "Open" status.

Twenty of the 22 passengers involved in the March 13 accident sustained minor injuries during the rollover. If lapbelts had been available for all occupants at the time of the accident, passengers would not have hit the roof during the rollover, or fallen from their seats onto the floor or on top of other passengers. Nonetheless, had the passengers been wearing lapbelts, they probably still would have sustained similar types of minor injuries (abrasions, contusions, and fractured fingers and noses) during the rollover by contacts with the person seated next to them and the seatbacks in front of them. Passengers seated by the windows still would have struck the sidewalls and windows.

It is difficult to evaluate the effect lapbelt use would have had on the students who were more seriously injured. If the student seated in the right rear window seat sustained her bruised liver as result of being fallen on or stepped on by another passenger, or by falling across a seatback, lapbelt use might have prevented her injury. She did not know how she was injured however. If the student seated in the fifth row window seat received her broken clavicle from striking the floor as she remembers, lapbelt use could have prevented this injury. She still could have received some similar injury though, even if restrained, by striking the window, window frame, and side wall during the rollover or by contact with the person seated next to her.

The Safety Board is conducting a series of special investigations of schoolbus accidents to look more closely at the issue of the real-world performance of schoolbuses in crashes and at the adequacy of the occupant crash protection afforded in schoolbuses built under current Federal Motor Vehicle Safety Standards. The study is ongoing at this time.

CONCLUSIONS

Findings

1. The weather, the condition of the highway, and the pre-accident condition of the schoolbus were not causal factors in the accident.
2. The 17-year-old schoolbus driver was certified appropriately and met the State requirements to operate a schoolbus; however, the evidence indicated that he was inexperienced.
3. The unruliness of the students on the bus distracted the schoolbus driver from his driving task.
4. The crashworthiness of the schoolbus accident, which was built to meet minimum requirements of the 1977 Federal Motor Vehicle Safety Standards 220, 221, 222, and 301, relating to rollover protection, joint strength, passenger seating and crash protection and fuel system integrity, provided a high level of protection to the occupants in this accident.

5. The use of the lapbelt prevented the schoolbus driver from being injured.
6. Installation and use of lapbelts might have reduced the severity of the injuries sustained by the passenger with the broken clavicle and the passenger with the bruised liver. However, it is less likely that lapbelt use would have resulted in a substantial reduction in the number and nature of the minor injuries incurred by the remaining 20 passengers.
7. There was no fire extinguisher or first aid kit on the schoolbus at the time of the accident.
8. The tire chains secured to the legs of the two rear seats of the schoolbus presented a potential source of injury.
9. A guardrail was warranted according to the American Association of State Highway and Transportation Officials (AASHTO) Barrier Guidelines and would have prevented the schoolbus rollover.
10. Statistics for North Carolina, South Carolina, and Alabama show that the 16- and -17 year-old group of schoolbus drivers is overrepresented in schoolbus accident rates per million miles driven compared to the 18-year-old and older group of schoolbus drivers.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the inattention of the 17-year-old student schoolbus driver to his driving task which resulted in the schoolbus leaving the road, loss of control, and a subsequent overturn of the schoolbus. Contributing to the accident was the distraction of the driver by the unruly behavior of the student passengers. Contributing to the severity of the accident was the lack of a guardrail to redirect errant vehicles away from the steep embankment.

RECOMMENDATIONS

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

--to the National Highway Traffic Safety Administration:

Encourage school jurisdictions in all States to emphasize the portions of the Highway Safety Program Standard (HSPS) 17, "Pupil Transportation Safety," and the program manual for HSPS 17 addressing the handling of student behavioral problems in training courses for schoolbus drivers and in instruction given students in the rules for bus riders, enforcement actions to be taken for rule violations, and the need for students to practice good behavior at all times while riding on a schoolbus. (Class II, Priority Action) (H-85-53)

--to the Ashe County School District:

Comply with the Federal guidelines in Highway Safety Program Standard 17, "Pupil Transportation Safety," which suggests that "one emergency evacuation drill should be held during the first week of school each semester" and that "at least twice during each school year, each pupil who is transported in a school vehicle shall be instructed in safe riding practices." (Class II, Priority Action) (H-85-54)

Develop a program to follow up on reports of monthly schoolbus inspections in which missing or damaged safety equipment is noted, and assign specific responsibility for the replacement and repair of such items and for the correction of other noted safety hazards. (Class II, Priority Action) (H-85-55)

--to the State Directors of Pupil Transportation of Alabama, North Carolina and South Carolina:

Discontinue the practice of hiring 16- and 17-year-old schoolbus drivers. (Class II, Priority Action) (H-85-56)

--to the State Director of Pupil Transportation of North Carolina:

As an interim measure, take steps to correct passenger discipline problems being encountered by current schoolbus drivers under 18 years of age. (Class II, Priority Action) (H-85-57)

Ensure that local school districts in the State of North Carolina comply with the Federal guidelines in Highway Safety Program Standard 17, "Pupil Transportation Safety," which suggests that "one emergency evacuation drill should be held during the first week of school each semester" and that "at least twice during each school year, each pupil who is transported in a school vehicle shall be instructed in safe riding practices." (Class II, Priority Action) (H-85-58)

--to the North Carolina Department of Transportation:

Install a guardrail on North Carolina State Route 88 from 0.35 to 0.65 mile west of Jefferson, North Carolina, where warranted, based on the fill height and embankment slope which meet the criteria in the American Association of State Highway and Transportation Officials' "Guide for Selecting, Locating and Designing Traffic Barriers." (Class II, Priority Action) (H-85-59)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ JOHN K. LAUBER
Member

December 10, 1985

APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

Investigation

The National Transportation Safety Board learned of the accident through news media reports at 3:50 p.m., e.s.t., on March 14, 1985. Highway accident investigators were dispatched from the National Transportation Safety Board's Headquarters in Washington, D.C., and arrived on scene at 9:30 p.m. on March 17, 1985. Investigators were assisted by representatives from the North Carolina Highway Patrol and the Ashe County School District.

Depositions

There were no depositions taken or public hearings held in conjunction with these investigations.

APPENDIX B

HIGHWAY SAFETY PROGRAM STANDARD 17, PUPIL TRANSPORTATION SAFETY

I. Scope The standard establishes minimum requirements for a State highway safety program for pupil transportation safety, including the identification, operation, and maintenance of schoolbuses, training of personnel, and administration.

II. Purpose The purpose of this standard is to reduce to the greatest extent possible the danger of death or injury to school children while they are being transported to and from school.

III. Definitions "Type I school vehicle" means any motor vehicle with motive power, except a trailer, used to carry more than 16 pupils to and from school. This definition includes vehicles that are at any time used to carry school children and school personnel separately, and does not include vehicles that only carry school children along with other passengers as part of the operations of a common carrier.

"Type II school vehicle" means any motor vehicle used to carry 16 or less pupils to or from school. This does not include private motor vehicles used to carry members of the owner's household.

IV. Requirements Each State in cooperation with its school districts and its political subdivisions shall have a comprehensive pupil transportation safety program to ensure that school vehicles are operated and maintained so as to achieve the highest possible level of safety.

A. Administration 1. There shall be a single State agency having primary administrative responsibility for pupil transportation, and employing at least one full-time professional to carry out his responsibilities for pupil transportation.

2. The responsible State agency shall develop an operating system for collecting and reporting information needed to improve the safety of school vehicle operations, in accordance with Safety Program Standard No. 10, "Traffic Records," § 204.4.

B. Identification and equipment of school vehicles Each State shall establish and maintain compliance with the following requirements for identification and equipment of school vehicles. The use of stop arms is at the option of the State.

1. Type I school vehicles shall:

a. Be identified with the words "School Bus" printed in letters not less than 8 inches high located between the warning signal lamps as high as possible without obscuring visibility of the lettering from both front and rear, and have no other lettering on the front or rear of the vehicle.

b. Be painted National School Bus Glossy Yellow, in accordance with the colorimetric specifications of Federal Standard No. 595a, Color 13432, except that the head shall be either that color or lustrous black, matching Federal Standard No. 595a Color 37038.

c. Have bumpers of glossy black, matching Federal Standard No. 595a, Color 37038, unless, for increased night visibility, they are covered with a retroreflective material.

d. Be equipped with a system of signal lamps that conform to the schoolbus requirements of Federal Motor Vehicle Safety Standard 108, 49 CFR 571.21, and:

a. Have a system of mirrors that will give the seated driver a view of the roadway to each side of the bus, and of the area immediately in front of the front bumper, in accordance with the following procedure:

When a red, 30 inches long, is placed upright on the ground at any point along a traverse line 1 foot forward of the forwardmost point of a schoolbus, and extending the width of the bus, at least 7/8 inches of the length of the red shall be visible to the driver, either by direct view or by means of an indirect visibility system.

2. Type I school vehicles that are operated by a privately or publicly owned local transit system, and used for regular scheduled carrier transit route service as well as special school route service, shall meet all of the requirements of this standard except as follows:

a. Such vehicles need not be painted yellow and black as required by paragraphs 1(b) and 1(c) of this section.

b. In lieu of the requirements of paragraph 1(b) of this section, such vehicles shall, while transporting children to and from school, be equipped with temporary signs, located conspicuously on the front and back of the vehicle. The sign on the front shall have the words "School Bus" printed in black letters not less than 8 inches high, on a background of national school bus glossy yellow, as specified in paragraph 1(b) of this section. The sign on the rear shall be at least 10 square feet in size and shall be painted national school bus glossy yellow, as specified in paragraph 1(b) of this section, and have the words "School Bus" printed in black letters not less than 8 inches high. Both the 8-inch and 8-inch letters shall be Series "D" as specified in the Standard Alphabet-Federal Highway Administration, 1986.

c. Where such vehicles are used only in places where use of warning signal lamps is prohibited, they need not be equipped with the signal lamps required by paragraph 1(c) of this section.

3. Any school vehicle meeting the identification requirements of 1. and above that is permanently converted for use wholly for purposes other than transporting pupils to or from school shall be painted a color other than National School Bus Glossy Yellow, and shall have the stop arms and equipment required by section IV.B.1.d. removed.

4. Type I school vehicles being operated on a public highway and transporting primarily passengers other than school pupils shall have the words "School Bus" covered, removed, or otherwise concealed, and the stop arms and equipment required by section IV.B.1.d. shall not be operable through the usual controls.

5. A Type II school vehicle shall either:

(1) Comply with all the requirements for Type I school vehicles, or

(2) Be of a color other than National School Bus Glossy Yellow, have none of the equipment specified in IV.B.1.d, and not have the words "School Bus" in any location on the exterior of the vehicle, or in any interior location visible to a motorist.

b. The State shall establish conditions under which one or the other of the above two specifications for Type II vehicles shall apply.

C. Operation Each State shall establish and maintain compliance with the following requirements for operating school vehicles:

1. Personnel a. Each State shall develop a program for selecting, training, and supervising persons whose primary duties involve transporting school pupils, in order to ensure that such persons will attain a high degree of competence in, and knowledge of, their duties.

b. Every person who drives a Type I or Type II school vehicle occupied by school pupils shall, as a minimum:

(1) Have a valid State driver's license to operate such a vehicle(s);

(2) Meet all special physical, mental, and moral requirements established by the State agency having primary responsibility for pupil transportation, and

(3) Be qualified as a driver under the Motor Carrier Safety Regulations of the Federal Highway Administration 49 CFR 391, if he or his employer is subject to those regulations.

2. Pupil instruction. At least twice during each school year, each pupil who is transported in a school vehicle shall be instructed in safe riding practices, and participate in anti-drug education drills.

3. Vehicle operation a. Each State shall develop plans for minimizing highway use hazards to school vehicle occupants, other highway users, pedestrians, and property, including but not limited to:

(1) Careful planning and annual review of routes for safety hazards;

(2) Planning routes to ensure maximum use of buses, and avoid standstills;

(3) Providing loading and unloading zones off the main traveled part of highways, wherever it is practicable to do so;

(4) Establishing restricted loading and unloading areas for schoolbuses at, or near schools;

(5) Requiring the driver of a vehicle meeting or overtaking a schoolbus that is stopped on a highway to take on or discharge pupils, and on which the red warning signals specified in IV.B.1.d are in operation, to stop his vehicle before it reaches the schoolbus and not proceed until the warning signals are deactivated; and

(6) Prohibiting, by legislation or regulation, operation of any vehicle displaying the words "School Bus," unless it meets the equipment and identification requirements of this standard.

b. Use of flashing warning signal lamps while loading or unloading pupils shall be at the option of the State. Use of red warning signal lamps for any other purpose, and at any time other than when the school vehicle is stopped to load or discharge passengers shall be prohibited.

c. When vehicles are equipped with stop arms, such devices shall be operated only in conjunction with red signal lamps.

d. Seating (1) Seating shall be provided that will permit each occupant to sit in a seat in a privacy lateral location, intended by the manufacturer to provide seating accommodation for a person at least as large as a 5th percentile adult female, as defined in 49 CFR 571.3.

(2) Bus routing and seating plans shall be coordinated so as to eliminate standstills when a school vehicle is in motion.

(3) There shall be no auxiliary seating accommodations such as temporary or folding jump seats in school vehicles.

(4) Drivers of school vehicles equipped with lap belts shall be required to wear them whenever the vehicle is in motion.

(5) Passengers in Type II school vehicles equipped with lap belts shall be required to wear them whenever the vehicle is in motion.

D. Vehicle maintenance Each State shall establish and maintain compliance with the following requirements for vehicle maintenance:

1. School vehicles shall be maintained in safe operating condition through a systematic preventive maintenance program.

2. All school vehicles shall be inspected at least semiannually, in accordance with Highway Safety Program Manual Vol. 1, published by the Department of Transportation January 1989. School vehicles subject to the Motor Carrier Safety Regulations of the Federal Highway Administration shall be inspected and maintained in accordance with those regulations (49 CFR Parts 393 and 398).

3. School vehicle drivers shall be required to perform daily pretrip inspections of their vehicles and to report promptly and in writing any defects or deficiencies discovered that may affect the safety of the vehicle's operation or result in its mechanical breakdown. Pretrip inspection and condition reports for school vehicles subject to the Motor Carrier Safety Regulations of the Federal Highway Administration shall be performed in accordance with those regulations (49 CFR 392.7, 393.8, and 398.7).

V. Program evaluation The pupil transportation safety program shall be evaluated at least annually by the State agency having primary administrative responsibility for pupil transportation. The National Highway Traffic Safety Administration shall be furnished a summary of each evaluation.

APPENDIX C

HAZARDOUS ORDER NO. 2

§ 570.82 Motor-vehicle driver and outside helper (Order 2).

(a) *Finding and declaration of fact.* Except as provided in paragraph (b) of this section, the occupations of motor-vehicle driver and outside helper on any public road, highway, in or about any mine (including open pit mine or quarry), place where logging or sawmill operations are in progress, or in any excavation of the type identified in § 570.88(a) are particularly hazardous for the employment of minors between 16 and 18 years of age.

(b) *Exemptions—(1) Incidental and occasional driving.* The finding and declaration in paragraph (a) of this section shall not apply to the operation of automobiles or trucks not exceeding 6,000 pounds gross vehicle weight if such driving is restricted to daylight hours: *Provided*, Such operation is only occasional and incidental to the child's employment; that the child holds a State license valid for the type of driving involved in the job which he performs and has completed a State approved driver education course: *And provided further*, That the vehicle is equipped with a seat belt or similar device for the driver and for each helper, and the employer has instructed each child that such belts or other devices must be used. This subparagraph shall not be applicable to any occupation of motor-vehicle driver which involves the towing of vehicles.

(2) *School bus driving:* The finding and declaration in paragraph (a) of this section shall not apply to driving a school bus during the period of any exemption which has been granted in the discretion of the Secretary of Labor on the basis of an application filed and approved by the Governor of the State in which the vehicle is registered. The Secretary will notify any State which inquires of the information to be furnished in the application. Neither shall the finding and declaration in paragraph (a) of this section apply in a particular State during a period not to exceed the first 40 days after this amendment is effective while application for such exemption is being formulated by such State seeking merely to continue in effect unchanged its current program using such drivers, nor while such application is pending action by the Secretary.

(3) *Evaluation of application for exemption for school bus driving.* In evaluating the application of a State for an exemption for school bus driving under subparagraph (2) above the Secretary will consider the following:

(i) Whether the accident experience of school bus drivers under 18 years of age in the State, if any are employed, compares favorably with that of adult school bus drivers.

(ii) Whether school bus drivers are selected by the school principal and approved by the county superintendent or an official of equivalent responsibility.

(iii) Whether school bus drivers are required to have completed a State approved driver education course, or a special school bus driver training course prior to being allowed to transport passengers.

(iv) Whether training and testing of school bus drivers includes classroom and behind-the-wheel training and is this done by qualified officials.

(v) Whether school bus drivers are required to pass a physical examination.

(vi) Whether the operation of school buses is supervised by the school principal, the transportation or other equivalent officer, and State, county, or city police.

(vii) Whether school buses are thoroughly inspected a minimum of four times a year at a State, district, or county inspection station and receive maintenance and repairs at regular intervals to ascertain and insure their safe operating conditions on a continuous basis, and that all inspections, maintenance, and repairs are performed by qualified inspectors and mechanics.

(viii) Whether school bus drivers are provided with and required to use seat belts.

(ix) Whether adequate measures are taken by State and local officials to control the speed of school buses in order to insure that the buses are not driven at a speed greater than is reasonable and prudent.

(x) Whether adult chaperones, approved by local school authorities, accompany school bus drivers on special activity trips sponsored by the school.

(xi) Whether the school buses conform substantially to the Minimum Standards for School Buses, 1964 Revised Edition, recommended by the National Conference on School Transportation and published by the National Education Association.

(xii) Any other factors which the Secretary may find relevant in evaluating the application for exemption.

(c) *Definitions.* For the purpose of this section:

(1) The term "motor vehicle" shall mean any automobile, truck, truck tractor, trailer, semi-trailer, motorcycle, or similar vehicle propelled or drawn by mechanical power and designed for use as a means of transportation but shall not include any vehicle operated exclusively on rails.

(2) The term "driver" shall mean any individual who, in the course of his employment, drives a motor vehicle at any time.

(3) The term "outside helper" shall mean any individual, other than a driver, whose work includes riding on a motor vehicle outside the cab for the purpose of assisting in transporting or delivering goods.

(4) The term "gross vehicle weight" includes the truck chassis with lubricants, water and full tank or tanks of fuel, plus the weight of the cab or driver's compartment, body, and special chassis and body equipment, and payload.

(26 P.S. 2177, Sept. 16, 1961, as amended at 26 P.S. 2202, Aug. 9, 1966; 26 P.S. 2178, Dec. 22, 1971)