

# **HIGHWAY FACTORS GROUP CHAIRMAN'S FACTUAL REPORT**

(13 pages)



**NATIONAL TRANSPORTATION SAFETY BOARD  
OFFICE OF HIGHWAY SAFETY  
WASHINGTON, DC 20594**

**HIGHWAY FACTORS GROUP CHAIRMAN FACTUAL REPORT**

**A. ACCIDENT**

**Type:** Motorcoach Fire  
**Date and Time:** September 23, 2005 about 6:07 a.m. Central Daylight Time  
**Location:** Northbound Interstate Highway 45, 0.2 miles south of Mars Rd.,  
Near Wilmer, Dallas County, Texas  
**Vehicle:** 1998 MCI 54-passenger Motorcoach  
**Motor Carrier:** Global Limo  
**Fatalities:** 23  
**Injuries:** 14  
**NTSB #:** HWY-05-MH-035

**B. HIGHWAY FACTORS GROUP**

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### **C. ACCIDENT SUMMARY**

On September 23, 2005 at about 6:07 a.m. CDT, a 1998 MCI 54-passenger motorcoach was traveling northbound on Interstate Highway 45 (I-45) with 44 passengers and the driver, evacuating in anticipation of Hurricane Rita. The passengers were from an assisted living facility in Bellaire, Texas, and most needed to be carried or assisted onto the motorcoach by firefighters. The trip began about 2:30 p.m. on September 22, 2005. The motorcoach had been traveling over 13 hours in heavy traffic when the right rear (#3 axle) tire went flat and needed to be changed near the FM 1126 overpass in Rice, Texas. The tire left approximately 6,800 ft. of tire marks before the motorcoach came to a stop. A service mechanic was summoned to assist and he changed the tire. The motorcoach continued north on I-45 for about 26 miles. At approximately 6:00 a.m. a motorist noticed the right rear (#3 axle) hub was glowing red/white hot. He was able to stop the motorcoach in the left traffic lane and told the driver (who did not speak English) of the danger. The motorcoach driver proceeded to pull the vehicle to the right shoulder, where he exited along with a nursing staff-passenger (the trip coordinator) and two other nurse-passengers and saw flames coming from the right rear wheel well. The passengers, with help from the nursing staff on-board and other motorists, began to disembark. At 6:07 the first call was made to 911. Fourteen intact oxygen cylinders were recovered from the motorcoach along with parts to possibly 4 others. One of those cylinders shows evidence of failure. Six nursing staff-passengers on the vehicle, a parent of one of the nursing staff, and 14 patient-passengers were able to exit the burning vehicle. Twenty-three patient-passengers, many of those who needed assistance in walking or needed to be carried off the vehicle were unable to escape.

## **D. DETAILS OF THE INVESTIGATION**

Prefatory data was obtained that included weather data, construction history, average daily traffic, vehicle classification data, and traffic and fatal accident summaries. Highway data was obtained that included functional classification, highway design, speed limit, traffic conditions on IH-45 at the time of the accident, and area of the burned debris field on IH-45.

Tests were done to determine the 85<sup>th</sup> percentile speed<sup>1</sup> for northbound IH-45 traffic on September 27, 2005. The Texas Department of Transportation (TxDOT) performed skid tests in the northbound lanes of IH-45 in the vicinity of the accident on October 10, 2005.

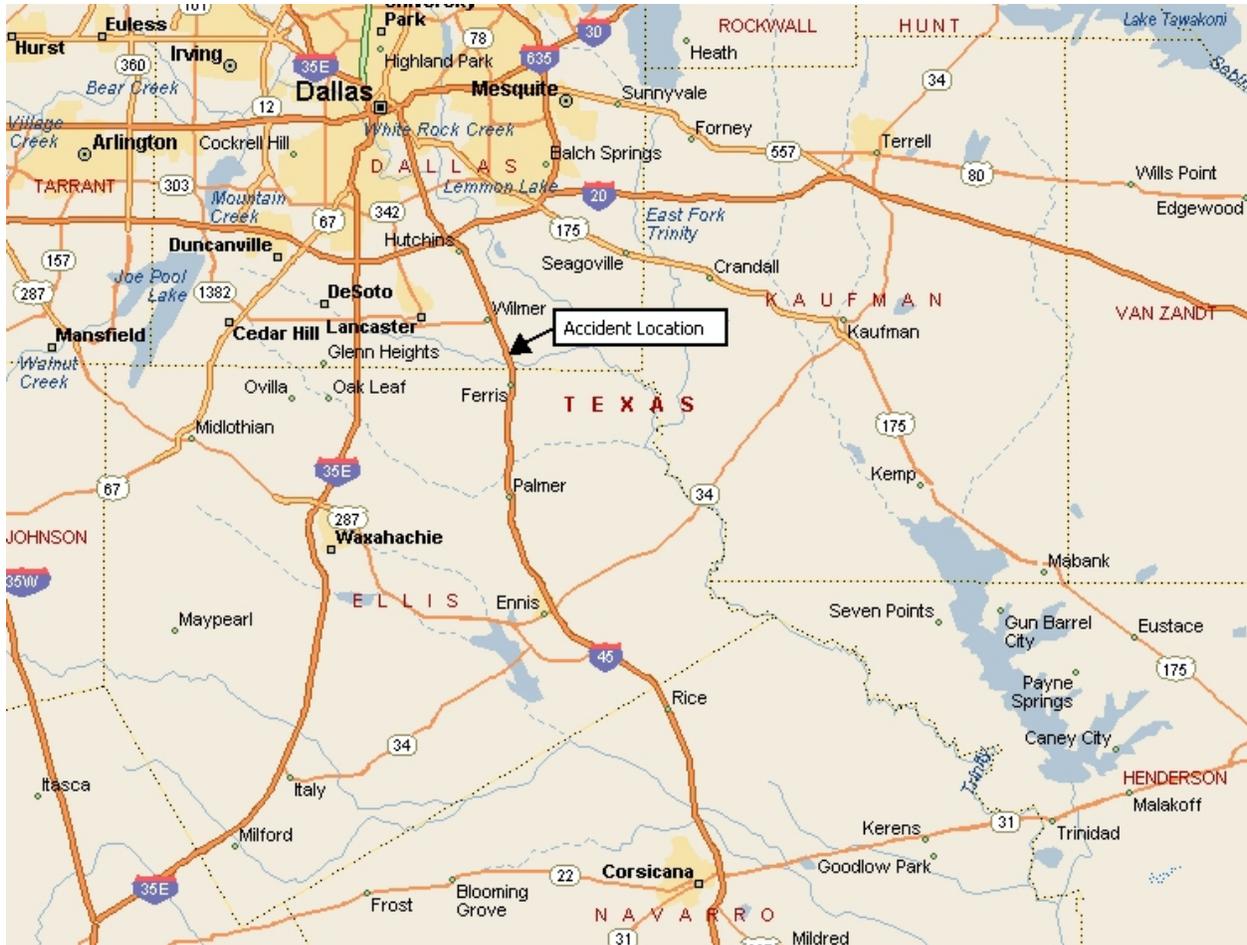
### **1. PREFATORY DATA**

#### **1.1 ACCIDENT LOCATION**

The accident occurred on Interstate Highway 45 (IH45) northbound approximately 1,000 feet north of the exit ramp to Mars Road at Mile Marker 269.5. Figure 1 illustrates the accident site was located about 17 miles south of the City of Dallas downtown area in Dallas County, Texas.

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<sup>1</sup>The 85<sup>th</sup> percentile speed is the speed at which 85% of the vehicle traffic is traveling either at or below that speed or, 15% of the vehicle traffic is traveling above that speed.



**Figure 1 – Location Map**

## 1.2 WEATHER DATA

The weather data was obtained from Lancaster Airport (KLNC) in Lancaster, Texas, located approximately 4 miles west of the accident location. The following weather condition was reported on September 23, 2005:

- At 6:03 a.m. – temperature of 72 degrees Fahrenheit, visibility unrestricted at 10 statute miles, scattered clouds at 9,500 feet, and dew point temperature of 61 degrees Fahrenheit. No precipitation was reported on September 22-23, 2005.

### 1.3 CONSTRUCTION HISTORY

IH-45 in the vicinity of the accident was reconstructed by the Texas Department of Transportation (TxDOT) in 1997<sup>2</sup>. IH-45 was reconstructed with the following pavement material:

- 13 inches of concrete pavement,
- 4 inches of asphalt concrete pavement, and
- 6 inches of lime treated subgrade.

### 1.4 AVERAGE DAILY TRAFFIC

The average daily traffic (ADT) on IH-45 in the vicinity of the accident was provided by the Texas Department of Transportation (TxDOT). The average daily traffic is shown in Table 1.

**Table 1 – Average daily traffic on IH-45 in the vicinity of the accident**

<b>Year</b>	<b>Average Daily Traffic (ADT)</b>
1999	35,000 vehicles per day
2000	39,000 vehicles per day
2001	38,000 vehicles per day
2002	40,000 vehicles per day
2003	44,000 vehicles per day

### 1.5 VEHICLE CLASSIFICATION DATA

The most recent data given by the Texas Department of Transportation (TxDOT) for vehicle classification data in the vicinity of the accident was for May 2005. Table 2 shows the vehicle classification data for IH-45 from IH-20 to Malloy Bridge Road.

**Table 2 – Vehicle classification data for IH-45 from IH-20 to Malloy Bridge Road**

<b>Type of vehicle</b>	<b>Percent (%) of vehicle</b>
Light duty vehicles	83.5%
Medium duty vehicles	2.4%
Heavy duty vehicles	14.1%
<b>Total</b>	<b>100%</b>

<sup>2</sup>State of Texas Department of Transportation, Plans of Proposed State Highway Improvement, Federal Aid Project NH 97 (25), IH 45, Dallas County, from Malloy Bridge Road to IH20, September 9, 1997.

## 1.6 TRAFFIC AND FATAL ACCIDENT SUMMARY

The Texas Department of Transportation (TxDOT) provided the traffic and fatal accident summary on IH-45 within a 5 mile radius of the accident from 1998 through 2001. Table 3 provides the traffic and fatal accident summary.

**Table 3 – Traffic and fatal accident summary on IH-45 within a 5 mile radius of the accident**

<b>Year</b>	<b>Number of Fatalities</b>	<b>Number of Fatal Accidents</b>	<b>Number of Injured</b>	<b>Total Number of Accidents</b>
1998	2	2	52	37
1999	1	1	33	47
2000	0	0	40	55
2001	3	2	65	62
<b>Total</b>	<b>6</b>	<b>5</b>	<b>190</b>	<b>201</b>

Table 4 provides a further analysis of the TxDOT traffic and fatal accident summary broken down by type of accident.

**Table 4 – Breakdown of traffic and fatal accident summary broken down by type of accident**

<b>Year</b>	<b>Overtaken</b>	<b>Hit Motor Vehicle</b>	<b>Pedestrian</b>	<b>Parked Car</b>	<b>Animal</b>	<b>Fixed Object</b>
1998	3	19	0	0	1	14
1999	3	22	1	1	0	20
2000	3	24	1	2	1	24
2001	7	31	1	3	1	19
<b>Total</b>	<b>16</b>	<b>96</b>	<b>3</b>	<b>6</b>	<b>3</b>	<b>77</b>

## 2. HIGHWAY DATA

### 2.1 FUNCTIONAL CLASSIFICATION

The Texas Department of Transportation (TxDOT) functionally classified IH-45 as a rural principal arterial road. The American Association of State Highway and Transportation Officials (AASHTO) classified a rural principal arterial road<sup>3</sup> as follows:

*“Rural principal arterials comprise the Interstate system and most rural freeways. They also include other multilane roadways and some two-lane highways that connect urban centers. Minor rural arterials link urban centers to larger towns and are spaced to provide a relatively high level of service to developed areas of a state.”*

### 2.2 HIGHWAY DESIGN

IH-45 in the vicinity of the accident was a divided six lane, concrete roadway that runs north and south. The measured width of the paved portion of the northbound roadway was approximately 58 feet. The paved area consisted of a 10 foot wide right shoulder, 3-12 foot wide main travel lanes (36 feet), and a 12 foot wide left shoulder. The paved portion of the southbound roadway was identical to the northbound roadway.

The northbound and southbound lanes were divided by a 24 foot wide concrete median. The concrete median contained a permanent 32 inch high median barrier.

Beyond the outside shoulder of the main travel lanes were one way frontage roads that parallel IH-45. The northbound frontage road was 20 feet wide, with an 8 foot wide left shoulder and a 2 foot wide right shoulder. The frontage road was separated from the edge of the main travel lane shoulder by approximately 41 feet.

### 2.3 SPEED LIMIT

The speed limit for IH-45 was 60 miles per hour (mph). For northbound traffic, the speed limit sign was located at Mile Marker 269, or 2,640 feet south of the accident.

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<sup>3</sup>A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials (AASHTO), 2004, Fifth Edition, page 443.

## 2.4 TRAFFIC CONDITIONS ON IH-45 AT THE TIME OF THE ACCIDENT

In preparation for Hurricane Rita's landfall in Texas, the Texas Department of Transportation instituted contra-flow lanes on IH-45 north of Houston to help the estimated 2 million evacuees get out of harm's way. The contra-flow lanes converted all lanes on IH-45 to one-way northbound. This was the largest reversal of traffic in Texas history, done to facilitate evacuations from the Houston area. All entrance ramps and intersecting highways were blocked to avoid head-on collisions. The effort required significant manpower, including law enforcement. Table 5 shows a chronology of the date, time, and limits of the one-way northbound operation on IH-45.

**Table 5 - Chronology of date, time, and limits of the one-way northbound operation on IH-45**

<b>Date</b>	<b>Time</b>	<b>Limits of IH-45</b>
September 22, 2005	12 noon	TxDOT works to improve traffic from Houston on IH-45
September 22, 2005	2:00 p.m.	All lanes on IH-45 from Conroe to Fairfield (90 mile stretch) go one-way northbound
September 23, 2005	6:07 a.m.	Time of Accident
September 23, 2005	5:00 p.m.	All traffic lanes on IH-45 from the Houston area to Ennis (190 mile stretch) go one way northbound

The contra flow lanes did not extend to the north as far as the accident location. At the time of the accident, the northbound and southbound lanes were operating at normal operations. Witnesses reported that traffic flow at the time of the accident was free flowing with vehicles traveling northbound on IH-45 at approximately 40 to 50 miles per hour.

## 2.5 AREA OF BURNED DEBRIS FIELD ON IH-45

The burned debris field on northbound IH-45 was located between the northbound lanes and the one-way frontage road. The area consisted of approximately 91 feet in length along IH-45 and approximately 41 feet in width.

### 3. TESTS AND RESEARCH

#### 3.1 85<sup>th</sup> PERCENTILE SPEED STUDY

Table 6 shows the raw data of the 85<sup>th</sup> percentile speed study conducted by NTSB investigators on September 27, 2005. The speed study was performed in the northbound lanes of IH-45 in the vicinity of the accident. The speed study was conducted between 11:00 a.m. and 12:00 p.m.

**Table 6 - 85<sup>th</sup> percentile speed study for northbound lanes of IH-45 in vicinity of the accident**

<b>Miles Per Hour</b>	<b>Number of Vehicles</b>	<b>Cumulative Total</b>
70 mph	13	115
65 mph	22	102
60 mph	58	80
55 mph	16	22
50 mph	6	6
Top Speed = 70 mph Total Vehicles = 115 <b>85<sup>th</sup> Percentile Total = 97.75</b>  85 <sup>th</sup> Percentile Speed = 65 mph		

### 3.2 FRICTION NUMBERS IN VICINITY OF ACCIDENT

TxDOT performed skid tests in the northbound lanes of IH-45 in the vicinity of the accident on October 10, 2005. Following the methods established by the American Society for Testing and Materials (ASTM) standard E274-97<sup>4</sup>, a trailer mounted friction testing device was towed behind a vehicle in the left and right lanes of northbound IH-45. Friction numbers<sup>5</sup> of individual test results, based on tire type, direction of travel, lane position, speed, and wheel path were recorded in Tables 7 and 8.

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<sup>4</sup>Standard test method for skid resistance of paved surfaces using a full-scale tire. This test method utilizes a measurement representing the steady-state friction force on a locked test wheel as it is dragged over a wetted pavement surface under constant load and at a constant speed while its major plane is parallel to its direction of motion and perpendicular to the pavement.

<sup>5</sup>A friction number represents the frictional properties of the pavement. These numbers are used to evaluate the skid resistance of the pavement relative to other pavements and/or to evaluate the change in skid resistance of the pavement with time.

**Table 7 – Texas Department of Transportation (TxDOT) friction numbers for northbound IH-45 under wet test conditions using a smooth tire**

<b>Mile Marker Number</b>	<b>Friction Number</b>	<b>Test Conditions</b>	<b>Tire</b>	<b>Direction</b>	<b>Lane</b>	<b>Speed (mph)</b>	<b>Wheel Path</b>
268.2	38	Wet	Smooth	Northbound	Right	49	LWP
268.3	42	Wet	Smooth	Northbound	Right	50	LWP
268.4	40	Wet	Smooth	Northbound	Right	50	LWP
268.5	35	Wet	Smooth	Northbound	Right	50	LWP
268.6	36	Wet	Smooth	Northbound	Right	50	LWP
268.7	40	Wet	Smooth	Northbound	Right	50	LWP
268.8	38	Wet	Smooth	Northbound	Right	50	LWP
268.9	31	Wet	Smooth	Northbound	Right	50	LWP
269.0	36	Wet	Smooth	Northbound	Right	50	LWP
269.1	39	Wet	Smooth	Northbound	Right	50	LWP
269.2	32	Wet	Smooth	Northbound	Right	50	LWP
269.3	34	Wet	Smooth	Northbound	Right	50	LWP
269.4	30	Wet	Smooth	Northbound	Right	50	LWP
268.2	41	Wet	Smooth	Northbound	Center	48	LWP
268.3	37	Wet	Smooth	Northbound	Center	49	LWP
268.4	37	Wet	Smooth	Northbound	Center	50	LWP
268.5	38	Wet	Smooth	Northbound	Center	50	LWP
268.6	38	Wet	Smooth	Northbound	Center	49	LWP
268.7	39	Wet	Smooth	Northbound	Center	49	LWP
268.8	42	Wet	Smooth	Northbound	Center	49	LWP
268.9	42	Wet	Smooth	Northbound	Center	49	LWP
269.0	38	Wet	Smooth	Northbound	Center	50	LWP
269.1	42	Wet	Smooth	Northbound	Center	50	LWP
269.2	34	Wet	Smooth	Northbound	Center	50	LWP
269.3	33	Wet	Smooth	Northbound	Center	49	LWP
269.4	36	Wet	Smooth	Northbound	Center	49	LWP

**Table 8 – Texas Department of Transportation (TxDOT) friction numbers for northbound IH-45 under wet test conditions using a ribbed tire**

<b>Mile Marker Number</b>	<b>Friction Number</b>	<b>Test Conditions</b>	<b>Tire</b>	<b>Direction</b>	<b>Lane</b>	<b>Speed (mph)</b>	<b>Wheel Path</b>
268.2	41	Wet	Ribbed	Northbound	Right	49	LWP
268.3	43	Wet	Ribbed	Northbound	Right	50	LWP
268.4	47	Wet	Ribbed	Northbound	Right	51	LWP
268.5	39	Wet	Ribbed	Northbound	Right	51	LWP
268.6	40	Wet	Ribbed	Northbound	Right	50	LWP
268.7	39	Wet	Ribbed	Northbound	Right	50	LWP
268.8	42	Wet	Ribbed	Northbound	Right	50	LWP
268.9	39	Wet	Ribbed	Northbound	Right	50	LWP
269.0	39	Wet	Ribbed	Northbound	Right	51	LWP
269.1	43	Wet	Ribbed	Northbound	Right	51	LWP
269.2	41	Wet	Ribbed	Northbound	Right	51	LWP
269.3	37	Wet	Ribbed	Northbound	Right	51	LWP
269.4	41	Wet	Ribbed	Northbound	Right	51	LWP
268.2	44	Wet	Ribbed	Northbound	Center	49	LWP
268.3	46	Wet	Ribbed	Northbound	Center	50	LWP
268.4	45	Wet	Ribbed	Northbound	Center	50	LWP
268.5	42	Wet	Ribbed	Northbound	Center	50	LWP
268.6	42	Wet	Ribbed	Northbound	Center	49	LWP
268.7	42	Wet	Ribbed	Northbound	Center	50	LWP
268.8	46	Wet	Ribbed	Northbound	Center	50	LWP
268.9	46	Wet	Ribbed	Northbound	Center	50	LWP
269.0	45	Wet	Ribbed	Northbound	Center	51	LWP
269.1	52	Wet	Ribbed	Northbound	Center	50	LWP
269.2	43	Wet	Ribbed	Northbound	Center	50	LWP
269.3	40	Wet	Ribbed	Northbound	Center	50	LWP
269.4	41	Wet	Ribbed	Northbound	Center	50	LWP

*Dan Walsh /S/*

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