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SCI/NASS COMBINATION INVESTIGATION

CASE NUMBER - NASS-2002-50-100E
LOCATION - Texas
VEHICLE - 2002 Honda Accord
CRASH DATE - December 2002

Submitted:

October 16, 2003
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Contract Number: DTNH22-01-C-07002

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

Technical Report Documentation Page

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Combination SCI/NASS investigation involving a 2002 Honda Accord equipped with Multiple Advanced Occupant Protection system features, and a 1988 Pontiac Fiero

16. *Abstract*

This combination SCI/NASS investigation concerns an air bag deployment crash involving a 2002 Honda Accord LX sedan (case vehicle) and a 1988 Pontiac Fiero GT coupe (other vehicle). This crash is of special interest because the case vehicle was equipped with multiple Advanced Occupant Protection System features, including dual stage frontal air bags and safety belt pretensioners, and the case vehicle's restrained driver (48-year-old male) sustained minor injuries in a crash of moderate severity for the case vehicle. The case vehicle was traveling south in the #2 southbound through lane of a four-lane, one-way roadway that was part of a divided city trafficway, approaching an uncontrolled three-leg intersection and intending to continue south. The intersecting roadway was the entrance to a shopping mall and joined the north-south roadway from the west (i.e., on the right for southbound traffic). The Pontiac had been traveling south in the inside (#4) southbound through lane of the same roadway and attempted to make a right turn across three through lanes, intending to travel west on the intersecting roadway. The case vehicle driver braked, attempting to avoid the crash. The crash occurred in the #2 southbound through lane, within the three-leg intersection. The front left area of the case vehicle impacted the right side of the Pontiac, causing the case vehicle's driver and front right passenger air bags to deploy. The case vehicle rotated approximately 80 degrees clockwise and came to rest heading west straddling the outside (#1) and #2 southbound lanes. The Pontiac rotated approximately 100 degrees clockwise and came to rest heading north in the mouth of the intersecting roadway. The case vehicle driver and the unrestrained back right passenger (67-year-old female) were transported via ambulance to a hospital, where both were treated for minor injuries and released. The restrained front right passenger (28-year-old male) did not sustain any injuries. The unrestrained back left and back center passengers (30- and 46-year-old females) sustained very minor injuries and did not seek any medical treatment.

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TABLE OF CONTENTS NASS-2002-50-100E

BACKGROUND

NASS-2002-50-100E

This combination SCI/NASS investigation was brought to the NHTSA's attention in December 2002 by NASS CDS sampling activities. This crash involved a 2002 Honda Accord LX sedan (case vehicle, NASS vehicle #2) and a 1988 Pontiac Fiero GT coupe (other vehicle, NASS vehicle #1). The crash occurred in December 2002, at 7:22 p.m., in Texas, and was investigated by the applicable municipal police. This crash is of special interest because the case vehicle was equipped with multiple Advanced Occupant Protection System features, including dual stage frontal air bags and safety belt pretensioners, and the case vehicle's restrained driver (48-year-old male, white, non-Hispanic) sustained police-reported "B" (non-incapacitating-evident) injuries in a crash of moderate severity for the case vehicle. This contractor received the coded NASS case on October 6, 2003. The Pontiac could not be located and was not inspected. This report is based on the coded NASS case, the police crash report, scene and case vehicle inspections and photographs, an interview with the case vehicle driver and interview-reported injury data, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling south in the #2 southbound through lane of a four-lane, one-way roadway that was part of a divided city trafficway, approaching an uncontrolled three-leg intersection and intending to continue south (i.e., there were four lanes in each direction, separated by a curbed median) (**Figure 1**). The intersecting roadway was the entrance to a shopping mall and joined the north-south roadway from the west (i.e., on the right for southbound traffic). It was dark but lighted, the concrete road surface was well-traveled but without defects and dry, and there were no adverse atmospheric conditions. The posted speed limit was 56 km.p.h. [35 m.p.h.]. The Pontiac had been traveling south in the inside (#4) southbound through lane of the same roadway and attempted to make a right turn across three through lanes, intending to travel west on the intersecting roadway. The case vehicle driver braked, attempting to avoid the crash. The crash occurred in the #2 southbound through lane, within the three-leg intersection.

Figure 1: Case vehicle's southbound approach toward impact (other vehicle attempted to turn right from the far left lane)

The front left area of the case vehicle impacted the right side of the Pontiac, causing the case vehicle's driver and front right passenger air bags to deploy. The case vehicle rotated approximately 80 degrees clockwise while moving southward and came to rest heading west straddling the outside (#1) and #2 southbound lanes. The Pontiac rotated approximately 100 degrees clockwise while moving westward and came to rest heading north in the mouth of the intersecting roadway.

The case vehicle was a 2002 Honda Accord LX front wheel drive, four-door, five- passenger sedan (VIN: JHMCG56402C------), equipped with a 4 cylinder, 2.3 liter gasoline engine and an automatic transmission with a console-mounted selector lever. Anti-lock brakes were an option for this model, but it is not known if the case vehicle was so equipped. The odometer reading is not known due to the non-functional electronic instrument panel. This was a rental car and the driver had no knowledge of the car's history. The wheelbase was 272 centimeters [106.9 inches]. The case vehicle was equipped with manual lap-and-shoulder safety belts at all five seat positions, and two-stage frontal air bags and retractor pretensioners at the two front outboard seat positions. The case vehicle was towed due to disabling damage.

CASE VEHICLE DAMAGE

The case vehicle sustained direct contact damage beginning at the front left corner and extending inward for 57 centimeters [22.4 inches], with induced damage extending across the entire front (**Figure 2**). The left-most area of the plastic bumper cover was torn away, with abrading and scuff marks extending nearly to the center, the left headlamp and turn signal assembly was shattered and the leading edge of the left fender was folded under and crushed rearward, causing the front left wheel/tire to be restricted. There was slight bending at the front left corner of the engine hood. Maximum crush was recorded as 17 centimeters [6.7 inches] at the left edge of what remained of the bumper, but this is problematic because the left bumper corner area was broken away (**Figure 3**). The wheelbase was not changed on either side. Except for the crushed left fender pressing against the left front tire, none of the wheels or tires were damaged. The windshield was cracked on the left side and there was no other glazing damage.

Figure 2: Case vehicle's front left damage area

The CDC for the case vehicle's single impact was determined to be **12-FLEW-1 (350)**. The WinSMASH reconstruction program, missing vehicle algorithm based on the case vehicle's crush profile, was used. The Total, Longitudinal and Lateral deltaVs for the case vehicle are, respectively: 13.0 km.p.h [8.1 m.p.h.], -12.8 km.p.h. [-7.9 m.p.h.] and +2.3 km.p.h. [+1.4 m.p.h.]. This is a borderline reconstruction but the results appear reasonable. This contractor judges that this was a crash of low severity (14 - 23 km.p.h. [9 - 14 m.p.h.]) for the case vehicle.

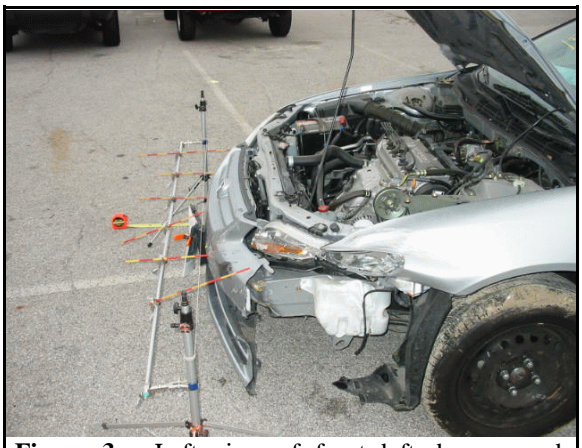


Figure 3: Left view of front left damage and restricted left front wheel

Inspection of the case vehicle's interior revealed no intrusions and no evidence of occupant contact on any of the vehicle's interior components. There was definite evidence of safety belt use by both front seat occupants, consisting of stretching of the safety belt webbing. In addition, both the driver's and front right passenger's safety belt retractors were locked with a substantial amount of webbing played out off the reel, indicating that they were in use when the pretensioners actuated (**Figure 4**).

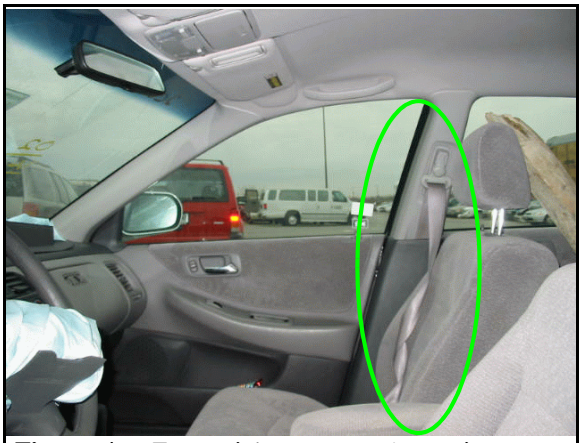


Figure 4: Front right passenger's seating area, showing manual belt retractor pretensioner locked with webbing drawn out (highlighted)

AUTOMATIC RESTRAINT SYSTEM

The driver's air bag was located in the steering wheel hub, with the module cover flaps in the H configuration. The module cover flaps were 13 centimeters [5.1 inches] horizontally, with the upper flap measuring 6 centimeters [2.4 inches] and the lower flap 10 centimeters [3.9 inches] vertically. The flaps opened at the tear points and there was no evidence of damage to the flaps or the adjacent structures. The driver's air bag was round with a diameter of 59 centimeters [23.2 inches] and there was no evidence of damage to the air bag. There were routine deployment scuffs on the front of the air bag and no other marks (**Figure 5**).

Figure 5: Front of driver's air bag

The front right passenger's air bag was located in the top of the instrument panel with two cover flaps in the H configuration. The module cover flaps measured 26 centimeters [10.2 inches] horizontally, with the upper flap measuring 3 centimeters [1.2 inches] and the lower flap 6 centimeters [2.4 inches] vertically. The flaps opened at the tear points and there was no evidence of damage to the flaps, but the entire module was displaced upward with respect to the larger opening into which it was installed (**Figure 6**). The front right passenger's air bag was rectangular, measuring 62 centimeters [24.4 inches] vertically and 65 centimeters [25.6 inches] horizontally. There was no evidence of occupant contact on the air bag (**Figure 7**).

Figure 6: Front right passenger's air bag module, showing slight displacement of entire structure

Both of the air bags had dual stage inflators. It is not known whether the second stage inflators ignited, but in a crash of low severity with both front seat occupants using their available manual three-point safety belts, it seems likely that this was a first-stage-only deployment.

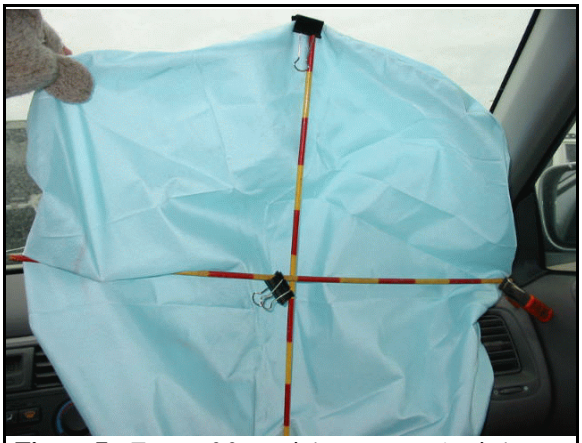


Figure 7: Front of front right passenger's air bag

CASE VEHICLE DRIVER KINEMATICS

The case vehicle driver (48-year-old male, white, non-Hispanic, 173 centimeters, 91 kilograms [68 inches, 200 pounds]) was restrained by his available, active, three-point, lap-and-shoulder safety belt system. He was seated in a normal driving posture, with his back against the seat back, both hands on the steering wheel and his feet on the floor or foot controls. His seat track was adjusted between the middle and rear most position and the seat back was slightly reclined. The vehicle was equipped with a tilt steering wheel but the driver could not recall how it was adjusted. At the time of the inspection, the tilt steering wheel was in the full up position.

The driver braked but made no steering maneuvers when he saw the other vehicle turning into his path. He moved forward slightly in response to the braking deceleration, loading the safety belt webbing as the retractor locked. The impact caused the driver to move forward and slightly leftward, toward the 350 degree direction of force, and caused the driver's air bag to deploy and the retractor pretensioners to actuate. His loading of the safety belt webbing resulted in contusions to his ribs. The deploying air bag scrubbed across his forearms, causing bilateral abrasions. The safety belt system held him essentially in place and he probably rebounded slightly into the seat back as the case vehicle rotated and came to rest.

DRIVER'S INJURIES

The driver was transported by ambulance to a hospital. His medical records were not acquired. According to the interviewee (same person), he sustained minor injuries and was treated and released.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Rib cage contusion, left	450202.1 minor	safety belt webbing	Certain	Interviewee
2.	Abrasions, forearms, bilateral	790202.1 minor	Driver's air bag	Certain	Interviewee

The case vehicle's front right passenger (28-year-old male, white, non-Hispanic, 180 centimeters, 118 kilograms [71 inches, 260 pounds]) was restrained by his available, active, three-point, lap-and-shoulder safety belt system. He was seated in a normal upright posture, with his seat against the seat back, his hands in his lap and his feet on the floor. His seat track was adjusted between the middle and rear most position and the seat back was slightly reclined.

The driver braked but made no steering maneuvers in an unsuccessful effort to avoid the collision. The front right passenger moved forward in response to the braking deceleration, loading the safety belt webbing as the retractor locked. The impact caused the passenger's air bag to deploy and the retractor pretensioners to actuate, and caused him to move forward and slightly leftward, toward the 350 degree direction of force. Because he was restrained by the safety belt he did not load heavily into the air bag and because he was cushioned by the air bag he did not load heavily against the safety belt webbing. The safety belt system held him essentially in place and he probably rebounded slightly into the seat back as the case vehicle rotated and came to rest.

FRONT RIGHT PASSENGER'S INJURIES

The front right passenger was not transported, did not seek any medical treatment and, according to the interviewee (driver), did not sustain any injuries.

BACK LEFT PASSENGER KINEMATICS

The case vehicle's back left passenger (30-year-old female, white, non-Hispanic, 170 centimeters, 109 kilograms [67 inches, 240 pounds]) was not using her available, active, three-point, lap-and-shoulder safety belt system. She was seated in a normal upright posture with her back against the seat back, her hands in her lap and her feet on the floor. Her seat track and seat back were not adjustable.

The driver braked but made no steering maneuvers in an unsuccessful effort to avoid the collision. The back left passenger moved forward in response to the braking deceleration. The impact caused her to move forward and slightly leftward, toward the 350 degree direction of force. Her left thigh impacted the back of the driver's seat back, causing a contusion. She rebounded into the seat back as the case vehicle rotated and came to rest.

BACK LEFT PASSENGER INJURIES

The back left passenger was not transported and did not seek any medical treatment. According to the interviewee (driver) she sustained a minor injury.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Contusion, left thigh	890402.1 minor	Back surface of driver's seat back	Probable	Interviewee

The case vehicle's back center passenger (46-year-old female, white, non-Hispanic, 163 centimeters, 91 kilograms [64 inches, 200 pounds]) was not using her available, active, three-point, lap-and-shoulder safety belt system. She was seated in a normal upright posture with her back against the seat back, her hands in her lap and her feet on the floor. Her seat track and seat back were not adjustable. The back center passenger moved forward in response to the braking deceleration. The impact caused her to move forward and slightly leftward, toward the 350 degree direction of force. Her right thigh and calf impacted the back of the front right passenger's seat back and/or the center console, causing contusions. She rebounded into the seat back as the case vehicle rotated and came to rest.

BACK CENTER PASSENGER INJURIES

The back center passenger was not transported and did not seek any medical treatment. According to the interviewee (driver), she sustained minor injuries.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Contusions, right thigh and calf	890402.1 minor	Back of front row seat back	Probable	Interviewee

BACK RIGHT PASSENGER KINEMATICS

The case vehicle's back right passenger [67-year-old female, white, non-Hispanic, 170 centimeters, 86 kilograms [67 inches, 190 pounds]) was not using her available, active, three-point, lap-and-shoulder safety belt system. She was seated in a normal upright posture with her back against the seat back, her hands in her lap and her feet on the floor. Her seat track and seat back were not adjustable. The back right passenger moved forward in response to the braking deceleration. The impact caused her to move forward and slightly leftward, toward the 350 degree direction of force. Her forehead impacted the back of the front right passenger's seat back, causing a contusion. She rebounded into the seat back as the case vehicle rotated and came to rest.

BACK RIGHT PASSENGER INJURIES

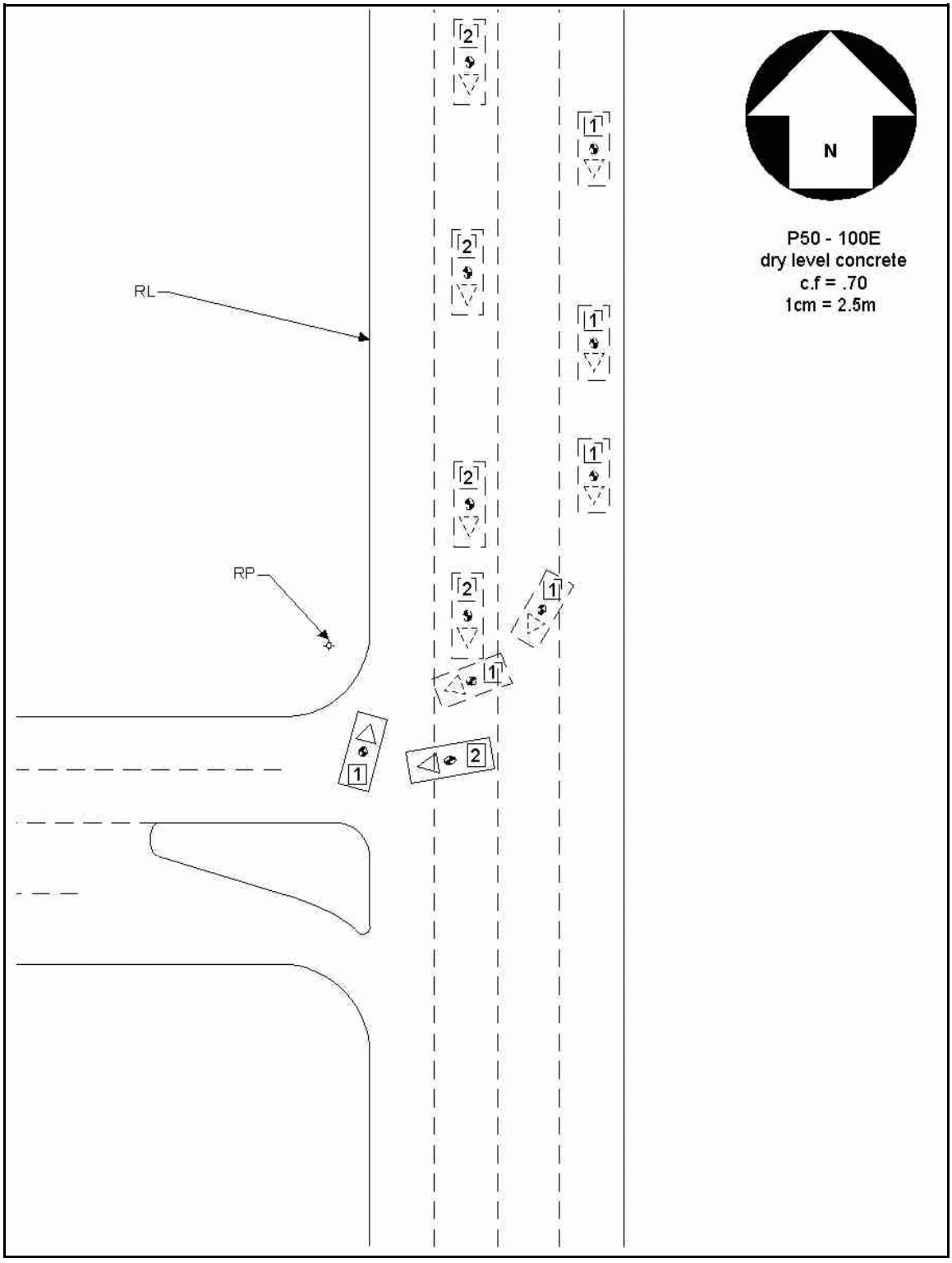
The back right passenger was transported to a hospital via ambulance, where she was treated and released. Her medical records were not acquired. According to the interviewee (driver), she sustained a minor injury.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Contusion, forehead	290402.1 minor	Back of front right seat back	Probable	Interviewee

The other vehicle was a 1988 Pontiac Fiero GT rear wheel drive, two-door, two-passenger coupe (VIN: 1G2PG1193JP------), equipped with a 2.6 liter V6 gasoline engine. Its wheelbase was 237 centimeters [93.4 inches]. The Pontiac was towed from the scene due to disabling damage. It could not be located and was not inspected

The WinSMASH reconstruction program, missing vehicle algorithm based on the case vehicle's crush profile, was used. The Total, Longitudinal and Lateral deltaVs for the Pontiac are, respectively: 19.0 km.p.h [11.8 m.p.h.], +6.0 km.p.h. [+3.7 m.p.h.] and -18.0 km.p.h. [-11.2 m.p.h.]. This is a borderline reconstruction but the results appears reasonable. This was a crash of low severity (14 - 23 km.p.h. [9 - 14 m.p.h.]) for the Pontiac.

The other vehicle's driver (24-year-old female) was police-reported as restrained by her available, active, three-point, lap-and-shoulder safety belt system. According to the police crash report, the other vehicle's driver did not sustain any injuries and was not transported. There was no other occupant in the Pontiac.


N
P50 - 100E
dry level concrete
c.f = .70
1cm = 2.5m
RL
RP