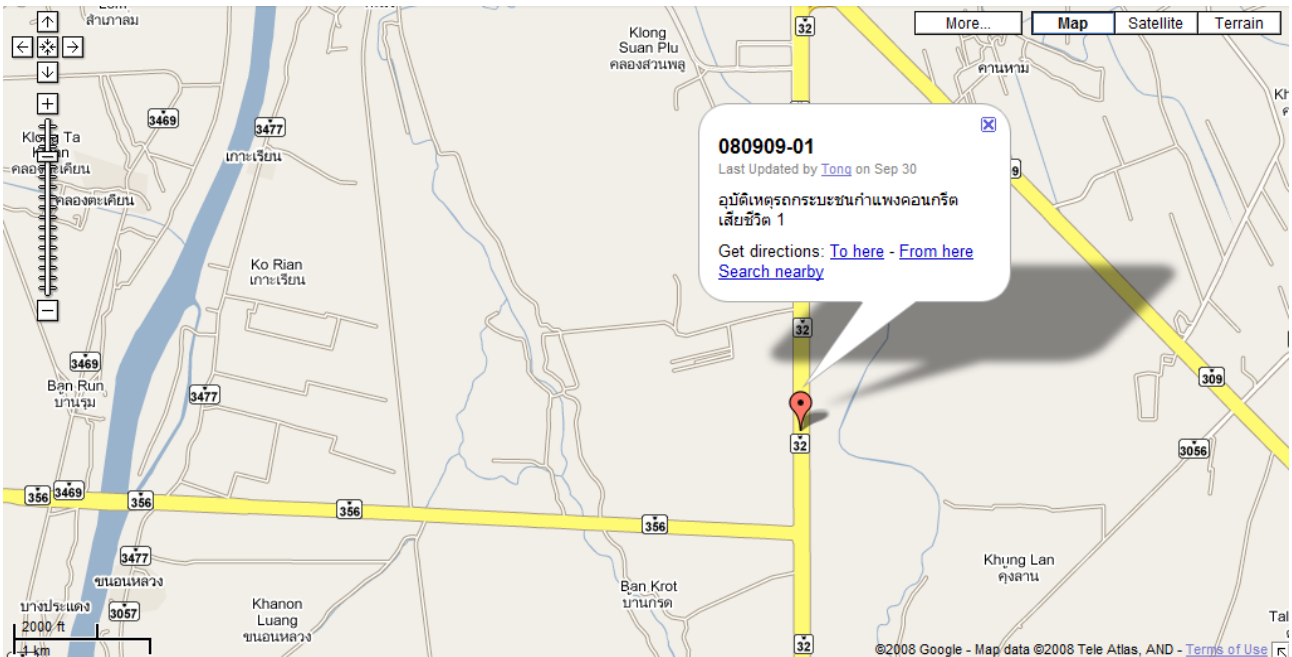


# Case ID: 080909-01

## Accident Narrative

On Tuesday 9 September 2008 morning, a 27 years old male started his lone trip from his home in Chachoengsao, planning to visit his friend. At about 06:00 AM, the vehicle left the traveling lane and hit a concrete barrier perpendicular to its direction at a u-turn dedicated median opening at km. 67+300 of Highway No. 32 (**Figure 3-1**). The vehicle was found with total damage on its front part and stopped close to the impact position. The driver was reported dead during the treatment on the way to the hospital.



**Figure 3-1: Location of crash Highway No. 32 km. 67+304**

The accident scene was at a median opening area. Originally, the opening was supposed to facilitate u-turning traffic for both directions. At present, the authority installed a set of temporary concrete barriers in order to close the access to the southbound traffic, allowing only the northbound traffic to u-turn. The point of impact (POI) was the connecting section between the longitudinal and perpendicular barrier, at the adjacent to the fast traffic lane (**Figure 3-2**).

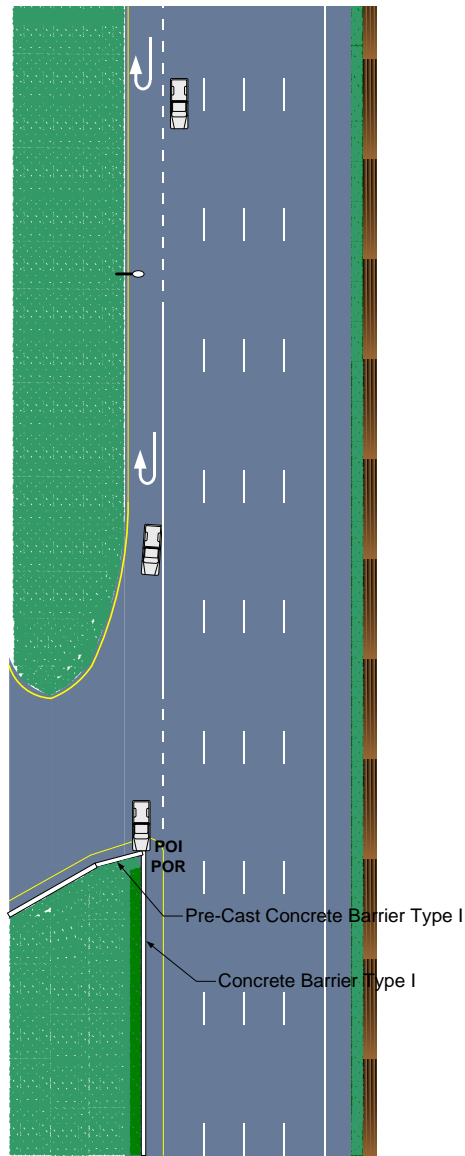


Figure 3-2: Schematic of Accident Scene

## Vehicle Information

The pickup was a Nissan Big M, 2,500 cc diesel engine, rear wheel drive, manual transmission, without ABS. It was bronze in color. It had an odometer reading of 219,403 km. The wheel base was 2.90 m, 5.12 m in long, and 1.625 m high. The interior dimension is shown in **Figure 3-3**. It was designed for two bucket seats for the driver and front passenger. Both seats were equipped with lap-shoulder belts. The extended cab, space behind the front seats, was fitted with a bench. The safety beam was installed inside on both side of the pickup.

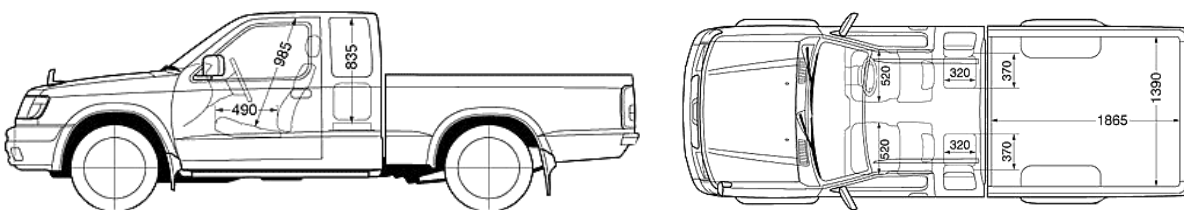


Figure 3-3: Pickup Dimensions

The tires on the crash vehicle were Bridgestone and Alpha. The details are shown in Table 3. All tires were different in manufacture made, model, or even size. Obviously, the rear wheels were modified as a racing sport wheels (**Table 3-1**).

**Table 3-1: Tire Detail**

Tire	Damage	Manufacture	Tire Name	Year	Size	Tread Depth	Pressure (psi)
1L	Yes	Bridgestone	Leo 75	2703	205/75 R14	2.5	N/A
1R	Yes	Bridgestone	Turonza	1306	205/65 R15	3	N/A
2L	No	Alpha	Accelra	0506	215/45Z R17	2	N/A
2R	No	Bridgestone	Turanza	0506	215/50 R17	1	21

The exterior conditions of V1 show massive damages of its front. The front bumper was separated and structure bars were bent from their original position. A-pillars were bent and the engine including coolant radiator and fan intruded into the occupants' compartment. The windshield was shattered. In addition, the rear axle was separated from its original position. The front left and front right tires had zero air pressure because the rim was bent due to impact. TARC evaluated the Collision Deformation Code (CDC) for the pickup as **12FD0EW5**.

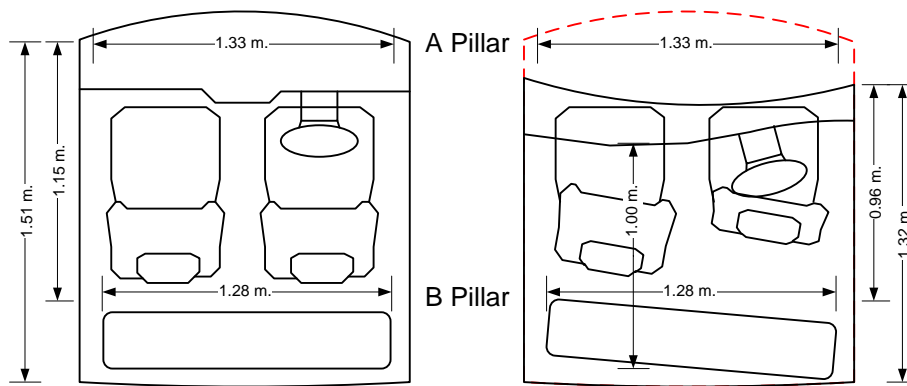


**Figure 3-4: The Damage of the Pickup**

The interior intrusion was extremely severe. The damaged steering wheel was displaced rearward, measured to be about 25 cm from the deformed driver's seat (**Figure 3-5**). The console was destroyed by the intrusion of the engine and other frontal components. The distance from the driver's seat to the radio player was measured to be about 50 cm. Blood marks were printed on the steering wheel and B-pillar. The comparison between the original and crashed interior is shown in **Figure 3-6**.



**Figure 3-5: Compressed Steering Wheel**



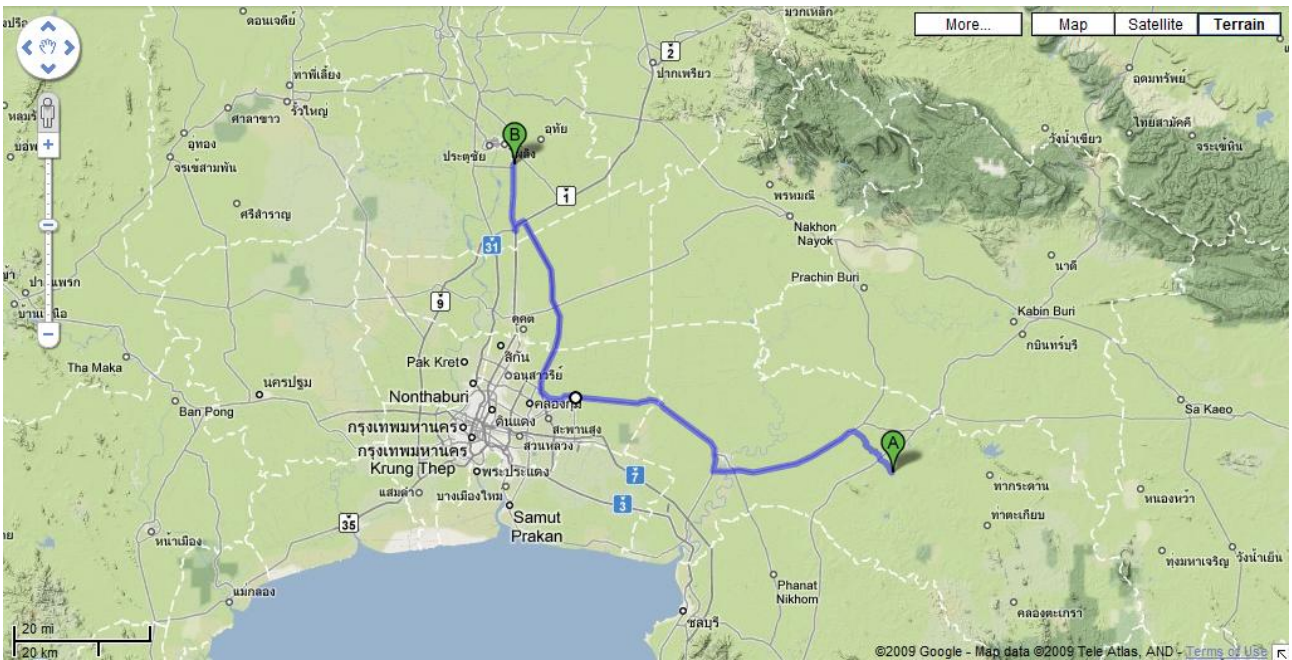
Original Interior Structure

Damaged Interior Structure

**Figure 3-6: Comparison of Interior Dimension**

## Driver Information

The driver was a 27 years old male, the vehicle's owner. He took a course at university and planned to visit his friend for a research work in Ayutthaya (B) (**Figure 3-7**). He started the trip from his home in Sanam Chaikhet, Chachoengsao (A), at about 05:00. According to his parent, this was not his routine trip.



**Figure 3-7: Pickup Route**

## Highway Information

The crash occurred on the north approach of Highway No.32, KM. 67+300, Bang Pa-In, Ayutthaya. This long straight section is designed as an 8-lane divided with a 3.6 m. lane width. The asphalt pavement had a coefficient of friction of 0.72 with 1% crown slope.

The accident scene was considered as a median opening u-turn area. Originally, it was supposed to serve the u-turn traffic for both directions. The authority then installed a set of temporary concrete barriers in order to close the southbound traffic, allowing only the northbound traffic to u-turn as shown in **Figure 3-8**.



**Figure 3-8: Median Opening U-Turn**

### Physical Evidence

At the end of the median opening u-turn, a set of concrete barriers type I was installed to protect errant vehicles out of the roadway. However, TARC found 7 concrete barriers set perpendicularly to the traffic direction. The point of impact (POI) was the connector between the longitudinal and perpendicular barriers, closest to the traffic lane, as shown in **Figure 3-9**. It broke into two parts; the top of the barrier flew into the median about 5 m. further away while the bottom of the barrier was still in position.

After closely examining the accident scene, no marks were seen on the pavement showing the movement of the pickup prior to the crash.



**Figure 3-9: Damaged Concrete Barrier**

### Injuries Information

The driver suffered a massive impact from the intrusion. He died on the way to the hospital. According to seatbelt inspection and witness statement, he did not use a seatbelt. He fell down to the ground near the driver’s door after impact. He suffered a fracture of the mandible, upper arm, forearm, and ribs. Detail of all injuries is shown in **Table 3-2**.

**Table 3-2: Summary of Occupant Injuries**

Person No.	Gender	Age	Level of Injury	Seat belt	Ejection	Injury
1 (Driver)	Male	27	Fatal	Not used	Completed	Open wounds of face Open wound of lip Fracture of mandible Superficial injuries to the front wall of thorax Multiple fractures of ribs Fracture of upper arm Fracture of forearm Superficial injuries to the knee Superficial injuries to the knee Superficial injuries to the lower leg Superficial injuries to the lower leg

## Accident Contributing Factors

### Left the roadway

According to the scene investigation, there was no mark showing the moving path of the pickup prior to hitting the concrete barrier. The direction of force was 0 degree, showing a full frontal impact. Accordingly, before approaching to the crash location, he drove along the wide approximately 15 km. long section from the Bang Pa-In interchange. No other vehicle involved with the crash was reported by the police and witnesses. His parents mentioned that the driver slept at about midnight and woke up early in the morning for this trip.

### Concrete Barrier

Unlike other median u-turns, a set of temporally concrete barriers were installed in the area of u-turn not allowing the south approach to u-turn. However, the barriers were arranged perpendicularly to the traffic without providing an end-treatment. The pickup ran directly into a corner, causing a severe crush to the front of pickup. Only a particular part of the barrier sustained damages.

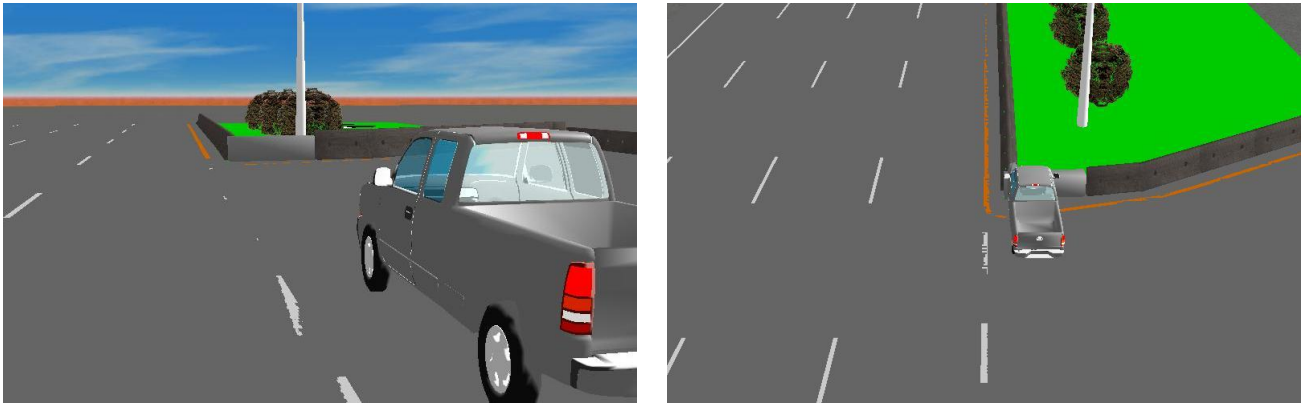
### Speed Estimation

Crush energy analysis was used to determine the pickup's speed of this crash. The frontal impact crash test for the Nissan pickup was selected. The stiffness coefficients A and B equal 31,101 N/m and 1,014 kN/m<sup>2</sup>, respectively. Considering the crash as a full frontal impact, finally, the equivalent barrier speed of the pickup was found to be 106 km/hr.

### Summary Information

<b>Vehicle 1</b>				
<i>Initial Conditions</i>		Steer Angles(deg)	Pre	Post
X(meters)	44.16	Left Front	0.00	0.00
Y(meters)	6.03	Right Front	0.00	0.00
Speed(KMH)	110	Left Rear	0.00	0.00
Forward Velocity(KMH)	110	Right Rear	0.00	0.00
Lateral Velocity(KMH)	0	Tire Drag(%)	Pre	Post
Angle	180.44	Left Front	-20.00	-20.00
Delta Angle	0.00	Right Front	-20.00	-20.00
Total Weight(kgd)	1500	Left Rear	-20.00	-20.00
Stiffness Coef.(N/cm <sup>2</sup> )	101	Right Rear	-20.00	-20.00
<i>Primary Impact Summary</i>				
Time of Collision	0.729			
Impact Speed(KMH)	106.2907			
Separation Speed(KMH)	1.901676			
Delta Speed(KMH)	108.2606			
Collision Impulse Time (sec)	0.06300002			
Angle (degs)	-90.56			

**Figure 3-10: Results of Reconstruction of the Crashed Pickup showing the Crush Profile**



**Figure 3-11: Simulation of Positions of the Vehicle Prior To and At Impact**

### **Seatbelt**

During the vehicle inspection, it was found that the seatbelt was solidly fixed in its pocket and couldn't be pulled out. One of the emergency officers mentioned that the driver was ejected from his seat at the time he arrived.

### **Significant Factors**

TARC determined that the probable cause of the 080909-01 crash occurrence was the drowsiness of the driver after driving on the long straight road section, as supported by the above mentioned evidences. The crash consequences were made more severe by the high traveling speed and the lack of a sufficient roadside protection system. The lack of seatbelt use reflected a big impact on the driver's facial and chest injuries.