

# Case ID: 090213-01

## Accident Narrative

In the early morning of 13 February 2009, a bus driver started his routine trip from Saraburi planning to take passengers, are factory workers, to Pratunam Pra-In, Ayutthya. At about 05:50, while traveling on the right lane of Highway No.1 at KM. 62+000 (**Figure 3-1**), the bus suddenly left the roadway on the right side and ran into the depressed median. The driver tried to recover the bus back into the roadway but the bus fell down on its right side after hitting the approach concrete barrier. The main impact occurred when the bus overturned and scratched the top of the barrier. It hit a pedestrian bridge column with its roof and stopped 26 meter further away on the travelling way (**Figure 3-2**).



**Figure 3-1: Crash Locations**

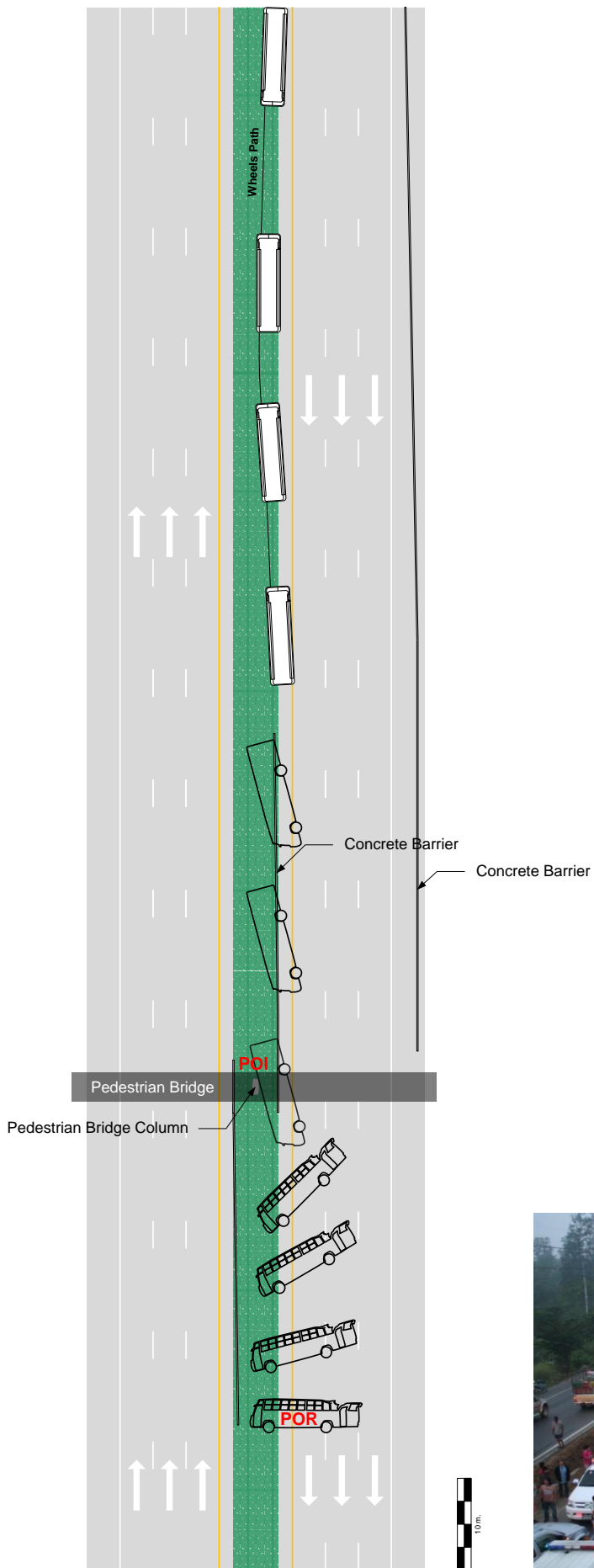


Figure 3-2: Crash Diagram of 090213-01

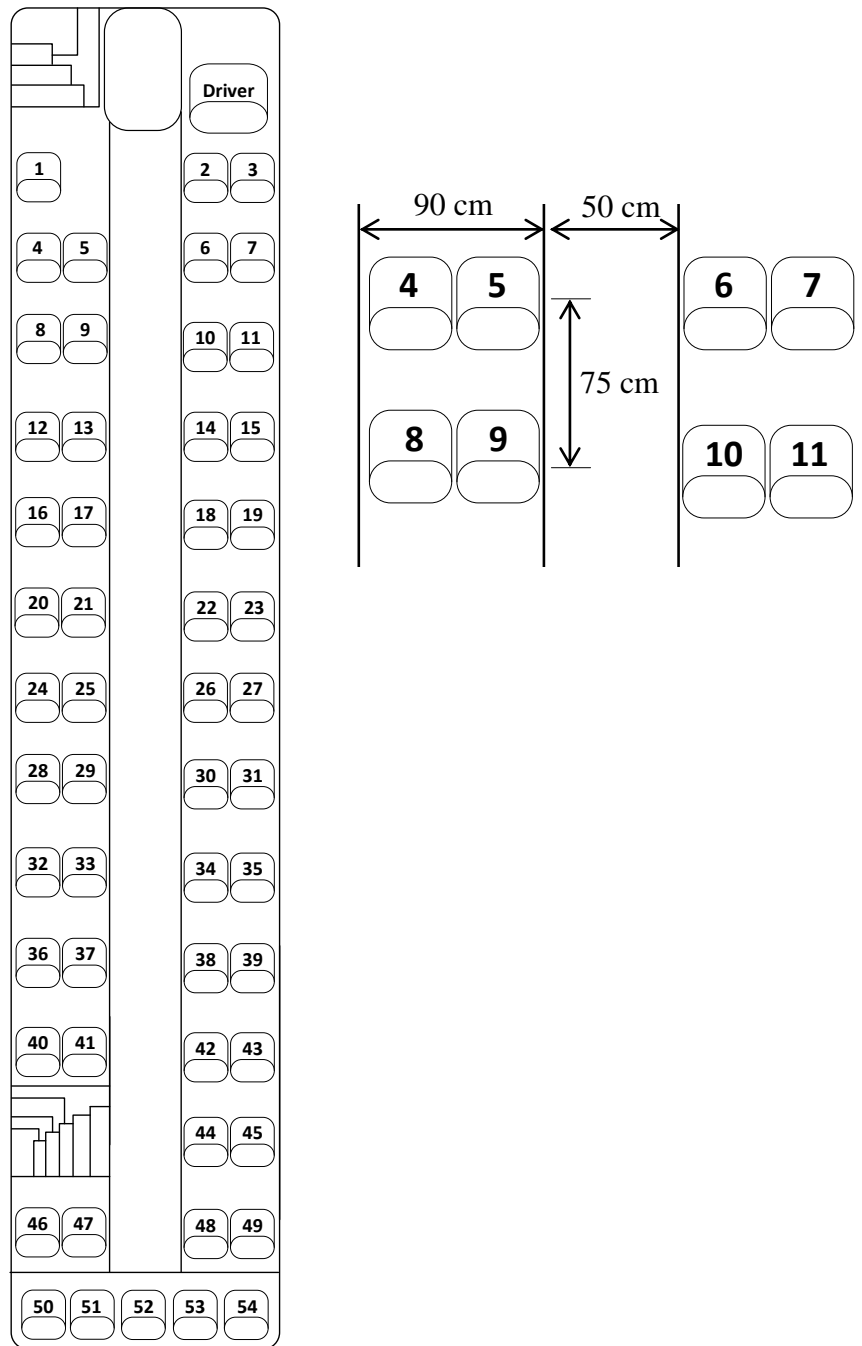
According to the details of the scene documentation the bus left the roadway 170 m before the approach to the bridge. The concrete barrier was unable to prevent the main impact, between the bus and the bridge column. It caused 3 fatalities, 6 serious injuries and 19 light injuries. Two fatalities were located at the seat where the roof of the bus hit the column.

## Vehicle Information

The bus in this single vehicle crash was a single deck bus which was locally assembled in Thailand. The body structure was emulated with a colorful artwork all around (**Figure 3-3**). The original dimensions were 3.50 m. high, 2.30 m. wide, and 11.80 m. long. The seats were arranged in 14 rows with 55 seats including the driver (**Figure 3-4**). Two seats are assembled as a pair, except for the first seat near the front stairs and another five seats on the last row. At the position of the twelfth row there is a space for the staircase on the left side.



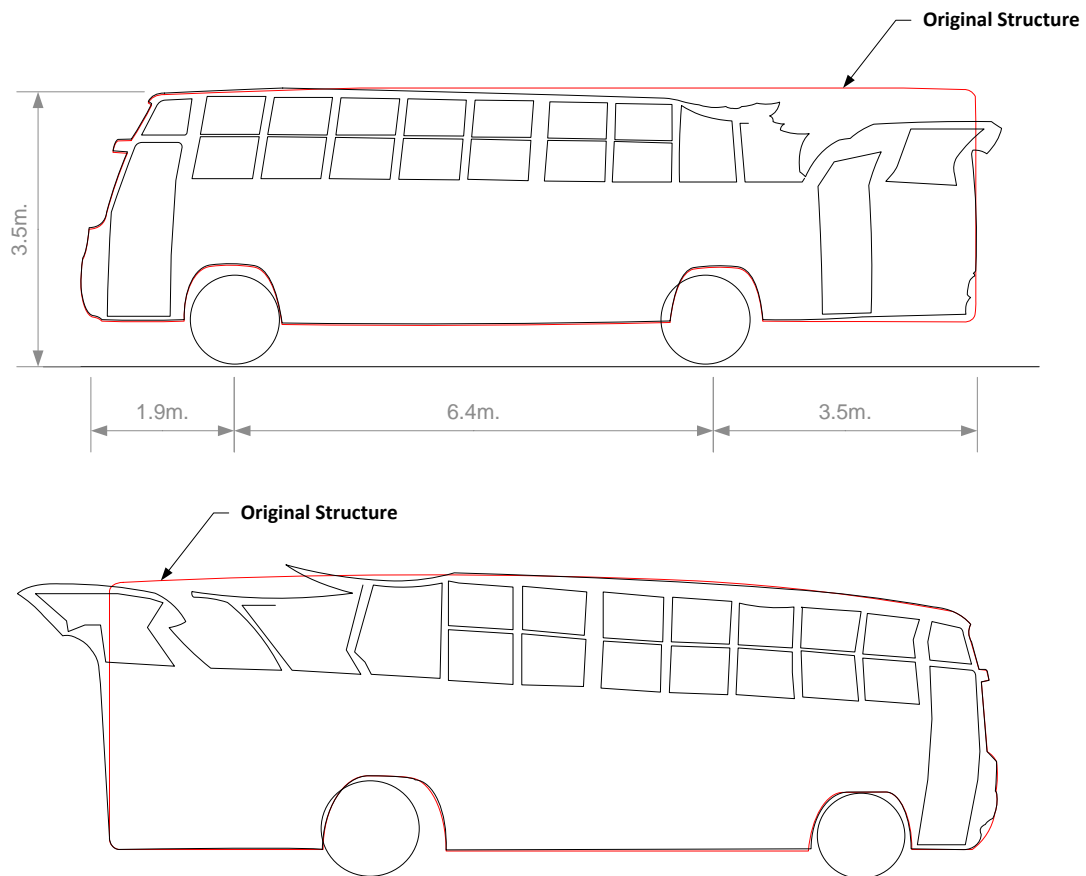
**Figure 3-3: Bus Dimension**



**Figure 3-4: Seating Configuration**

### Vehicle Damages

The major damage to the bus occurred on the roof at the position of the eleventh and twelfth rows, 9.10 m from the front (**Figure 3-5** and **Figure 3-6**). The impact force split the roof and the structure on the luggage case. Blood stains are shown at this position. There was a rupture damage with 0.80 – 1.40 m in width. The intrusion pushed and skewed the pillars on the rear part backward, causing shattered windows starting from the ninth pillar.



**Figure 3-5: Damage Pattern**



**Figure 3-6: Damages to the Roof**

Another damage pattern was located on the entire right side of the bus since it stopped on the left side at point of impact. All windows were shattered. An obvious scratch mark was printed diagonally from the upper corner down to the rear axle at about 70 cm (**Figure 3-7**) from the ground. The bent rear right wheel was pushed from its original position and the rim deformed. A light damage occurred on the roof between the fourth and fifth pillars.





**Figure 3-7: Damage Pattern on the Right**

## Driver Information

The bus driver was a 26 year old male. This was his routine trip to bring a group of factory workers from Sao Hai, Saraburi to Pratunam Pra-In, Ayutthaya. Usually, he worked from Monday to Friday. This month, he had taken the morning trip (05:00 – 07:00) and afternoon trip (13:00 – 17:00), switching next month to take the morning trip and night trip (21:00 – 23:30).

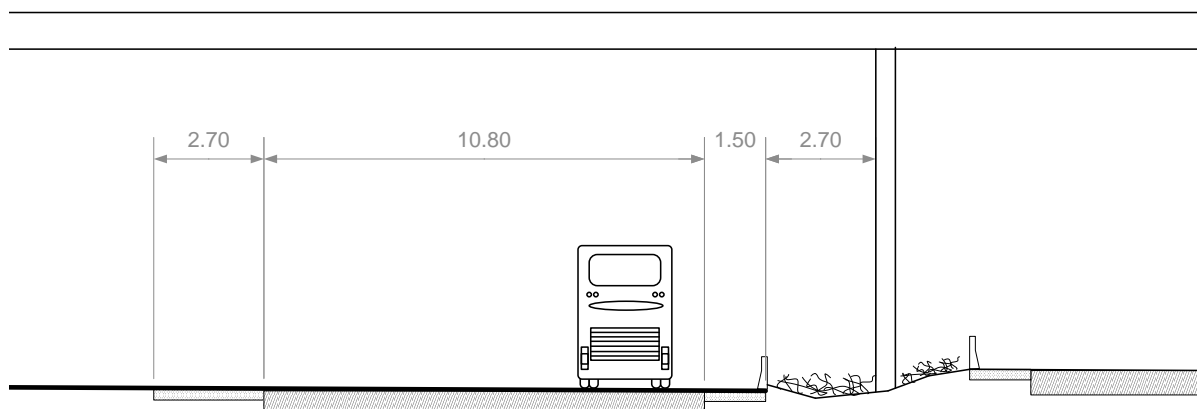
He slept between 21:00 and 04:00 the night before this trip. He collected all of the passengers from Sao Hai at about 05:05. It was still dark early in the morning while traveling on Highway No.1 and the headlight needed to be turned on. In the period before the crash while the bus was on the right lane at a speed of 85 km/hr the driver saw a heavy truck changing lanes from the left lane to the middle. A following car then avoided hitting the truck by bearing right to his traveling lane. He tried to avoid the oncoming car but failed to direct the bus on the road leading it to finally run into the depressed median. The driver mentioned having no chance of returning the bus to the roadway and lost control by hitting the concrete barrier and pedestrian bridge column. He suffered light injuries but didn't request to be hospitalized.

## Highway Information

The crash occurred on the south approach of Highway No.1 in Wang Noi, Ayutthaya. It is a primary road connecting Bangkok to the Northern and Northeastern regions of Thailand. It starts at Victory Monument in Bangkok, runs through the provinces of Pathumthani, Ayutthaya, Saraburi, Lopburi, Nakhon Sawan, Chainat, Kamphaeng Phet, Tak, Lampang, Phayao and ends in Mae Sai district of Chiang Rai. The total length of the road is approximately 1,005 km.

In the area of the crash, the road is a ten-lane divided road with frontage. There are 3.6 m. three-lane on the main road and two-lane on the frontage road with a 1.5 m. inner shoulder in each direction. The asphalt pavement had a coefficient of friction of 0.80 on the travelled lanes and shoulder. The grassy depressed median, splitting the north and south approach is 5.0 m. wide (**Figure 3-8**).

A pedestrian bridge is located at km.60+300. Two 47 x 164 cm. concrete columns stand on each side of the road with another similarly sized column supporting at the depressed median. All columns are shielded by a concrete barrier, located 2.9 m. away from the columns and a continuous w-beam guardrail on the north approach only (**Figure 3-9**).



**Figure 3-8: Cross Section of Highway No.1 (Main Road)**



**Figure 3-9: Pedestrian Bridge Column at the Depressed Median**

### **Physical Evidences**

The evidence found at the crash scene (**Figure 3-10**) showed that the bus left the roadway 170 m from the pedestrian bridge's column (**point no.1**). It started with a wheel track printed on the grass next to the inner shoulder with a tiny angle. The bus kept moving on the depressed median for about 87 m. The track then started to return to the roadway (**point no.2**). However, it collided with the concrete electric pole in the next 38 m, breaking it into three separate parts (**point no.3**).

The 14 m long tire mark was to be seen on the pavement 5m further away, next to the beginning of the approach concrete barrier (**point no.4**). The sliding tire mark printed exactly on the footing of the approach concrete barrier (**point no.5**). Within several meters further away, a continuous scratch mark was printed on the top of the concrete barrier until reaching its end. In addition, at the pedestrian bridge column, the collision debris were noted from the ground to a height of 3.5 m (**point no.6**). The Point Of Rest (POR) (**point no.8**) was located about 25 m further away from the pedestrian bridge's column. Between them, there were several landing furrows on the pavement (**point no.7**).

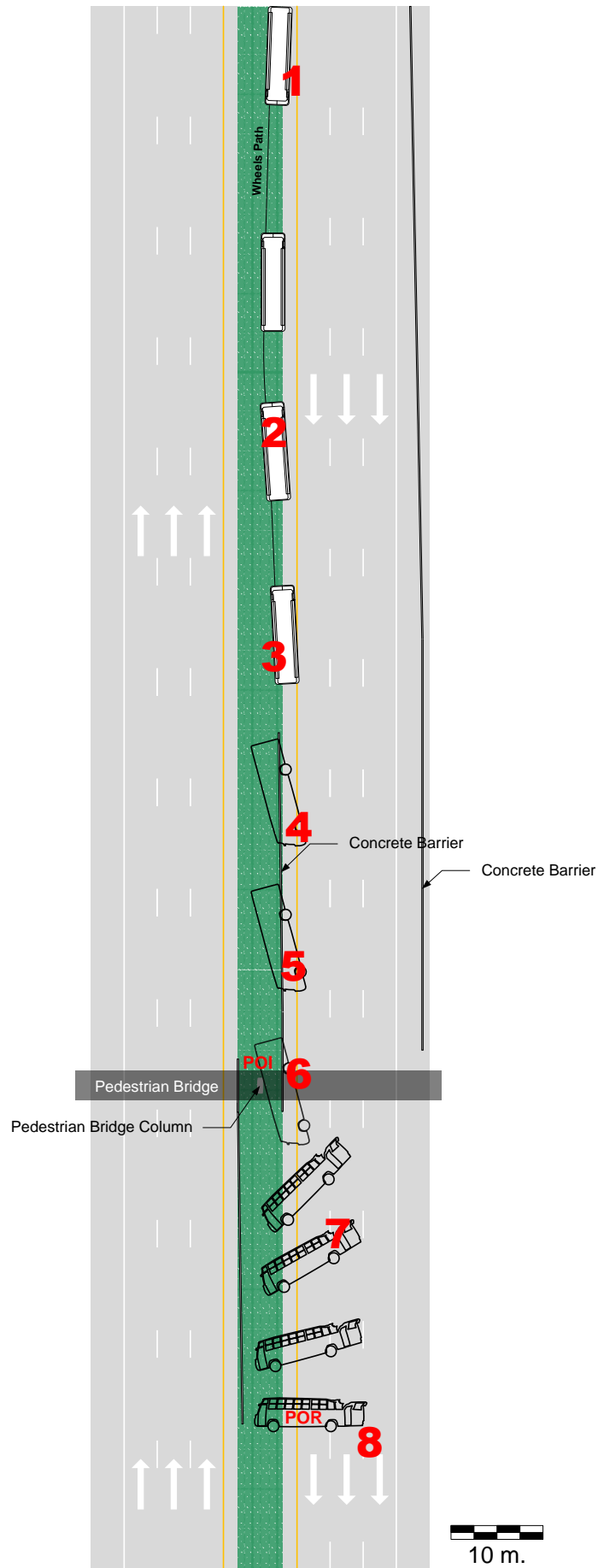


Figure 3-10: Evidences at the Crash Scene



## Injuries Information

Three passengers were fatally injured in this crash. Two of them were reported sitting on seats no. 44 and 45, while another fatality couldn't be located. 7 serious injuries needed treatment at Ayutthaya Hospital, Saraburi Hospital and Kasemrad Saraburi Hospital. Another 18 light injuries were treated at Bang Pa-In Hospital and Kasemrad Saraburi Hospital and discharged in the afternoon. **Table 3-1** is shown the summary of occupant injuries

**Table 3-1: Summary of Occupant Injury**

Person	Gender	Age	Role	Level of Injury	Injury	ICD 10
1	Female	30	Passenger	Serious	Open wound of scalp	S01.0
					Contusion of eyeball	S05.1
2	Male	28	Passenger	Serious	Open wound of cheek	S01.4
3	Female	36	Passenger	Serious	Contusion of eyeball	S05.1
					Contusion of eyeball	S05.1
					Open wound of cheek	S01.4
					Fracture of forearm	S52.9
					Fracture of lumbar vertebra	S32.0
4	Female	30	Passenger	Serious	Injury to the lungs	S27.3
					Fracture of malar	S02.4
					Crushing injury to the head	S07.9
					Superficial injury to the knee	S80.0
5	Female	35	Passenger	Fatal	Open wound of head	S01.8
					Fracture of rib	S22.3
					Fracture of femur	S72.0
6	Male	34	Passenger	Serious	Open wound of cheek	S01.4
					Superficial injury to the cheek	S00.8
					Fracture of forearm	S52.9
7	Female	38	Passenger	Serious	Open wound of head	S01.8
					Crushing injury to the thigh	S77.1
8	Female	31	Passenger	Serious	Open wound of scalp	S01.0
					Injury of muscle and tendon of lower back	S39.0
9	Female	39	Passenger	Fatal	Open wound of lip	S01.5
					Open wound of lip	S01.6
					Open wound of scalp	S01.0
10	Female	42	Passenger	Fatal	Contusion of eyeball	S05.1
					Open fracture of malar bone	S02.4
11 (Driver)	Male	29	Driver	Slight	N/A	N/A
12	Female	33	Passenger	Slight	N/A	N/A
13	Female	33	Passenger	Slight	N/A	N/A
14	Female	29	Passenger	Slight	N/A	N/A
15	Female	30	Passenger	Slight	N/A	N/A
16	Female	42	Passenger	Slight	N/A	N/A
17	Female	29	Passenger	Slight	N/A	N/A
18	Female	39	Passenger	Slight	N/A	N/A
19	Female	38	Passenger	Slight	N/A	N/A
20	Female	29	Passenger	Slight	N/A	N/A
21	Female	33	Passenger	Slight	N/A	N/A
22	Female	37	Passenger	Slight	N/A	N/A
23	Female	34	Passenger	Slight	N/A	N/A
24	Female	31	Passenger	Slight	N/A	N/A
25	Female	35	Passenger	Slight	N/A	N/A
26	Female	39	Passenger	Slight	N/A	N/A
27	Male	29	Passenger	Slight	N/A	N/A
28	Female	42	Passenger	Slight	N/A	N/A
29	Female	30	Passenger	Slight	N/A	N/A

## Accident Contributing Factors

### Leaving the Roadway

The crash occurred early in the morning on a long straight road. All witnesses, the passengers were sleeping. The blood alcohol test was not officially performed by the hospital. The events as mentioned by the driver are likely to have occurred. However, the issue of the loss of control of the vehicle cannot precisely be determined for lack of sufficient information.

In addition, it is not possible to estimate the bus' speed using the theory of momentum or energy analysis. There is only a trusted source of speeding warning system installed on the bus. This equipment was set to warn the driver by a beep sound if the speed was higher than 85 km/hr.

### Approach Concrete Barrier

The approach concrete barrier (**Figure 3-11**) is installed about 38 m ahead in order to protect an errant vehicle from colliding into a pedestrian bridge's column. Nevertheless, according to the mentioned evidences found at the crash scene it resulted in a negative outcome. The marks printed at points no.4 and 5 showed that the barrier prevented an evasive maneuver by the bus driver. It made the bus to rollover onto the top of the barrier, as supported by the matching scratch marks on the right side of the bus. The situation became worse when the bus hit the column, causing massive split damage to the roof structure and fatal injuries.



**Figure 3-11: Approach Concrete Barrier**

### Unprotected Occupants

Even though all seats were equipped with seatbelts (**Figure 3-12**) none of the occupants were reported wearing them. Similarly to other bus crashes, the level of severity of the consequences regarding occupants' injuries is increased by the collision between the occupants themselves. However, the issue of occupants' protection inside the bus was not been rose. The Land traffic act requires seatbelt usage only for the driver and front passenger.



**Figure 3-12: Seatbelts**

## **Significant Factors**

In this case (090213-01), TARC is unable to determine the reasons why the vehicle ran off the road due to lack of sufficient information. Nevertheless, the critical event was the vehicle rolling over after running through the approach concrete barrier and hitting the pedestrian bridge post. The severity of the crash consequences was increased due to the lack of a sufficient roadside protection system as well as an occupant protection system.