

Case ID: 060407-01

Accident Narrative

On 7 April 2006, at 9:30 A 23 years old male driver started his trip from Hi Tech Industrial Estate, Ayutthaya at about 7:00 in the morning. While he was traveling towards Bang Na on Highway No.1 at KM.41+100 (**Figure 3-1**), the front right tire suddenly blew out. He tried to slow the car by applying the brakes but the car failed to stop. It fell into a roadside concrete open ditch and moved for some distance. The pickup stopped in a roll position, the left wheels were in the canal and the right ones were along the roadside as shown in **Figure 3-2**. The driver, the only occupant, received no injury.

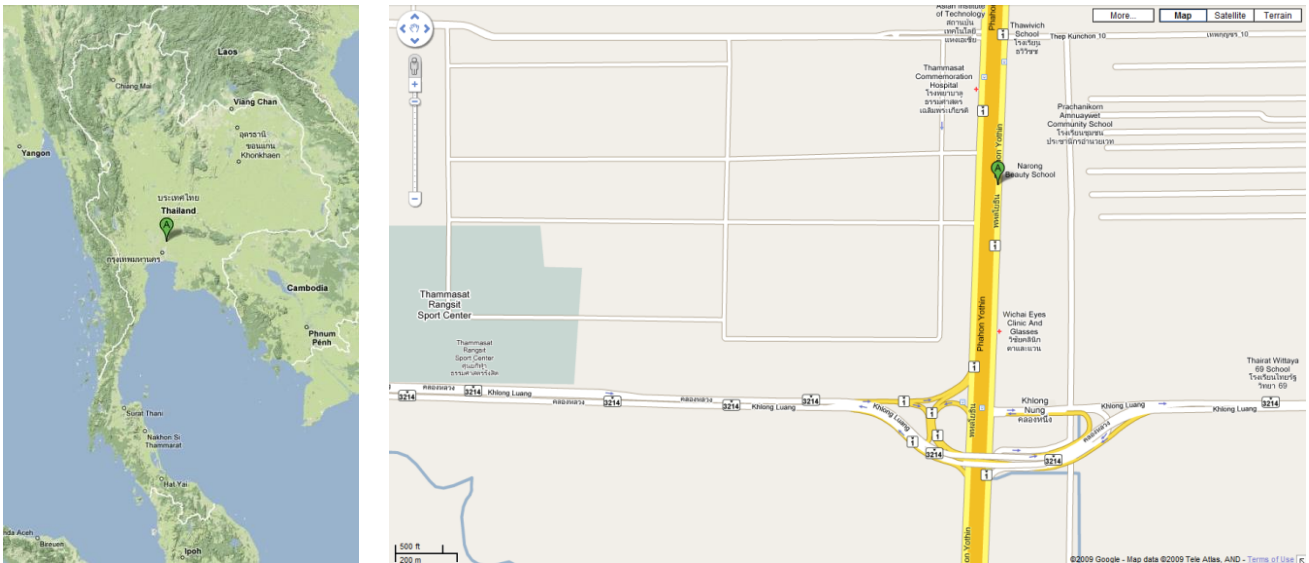


Figure 3-1: Accident Location

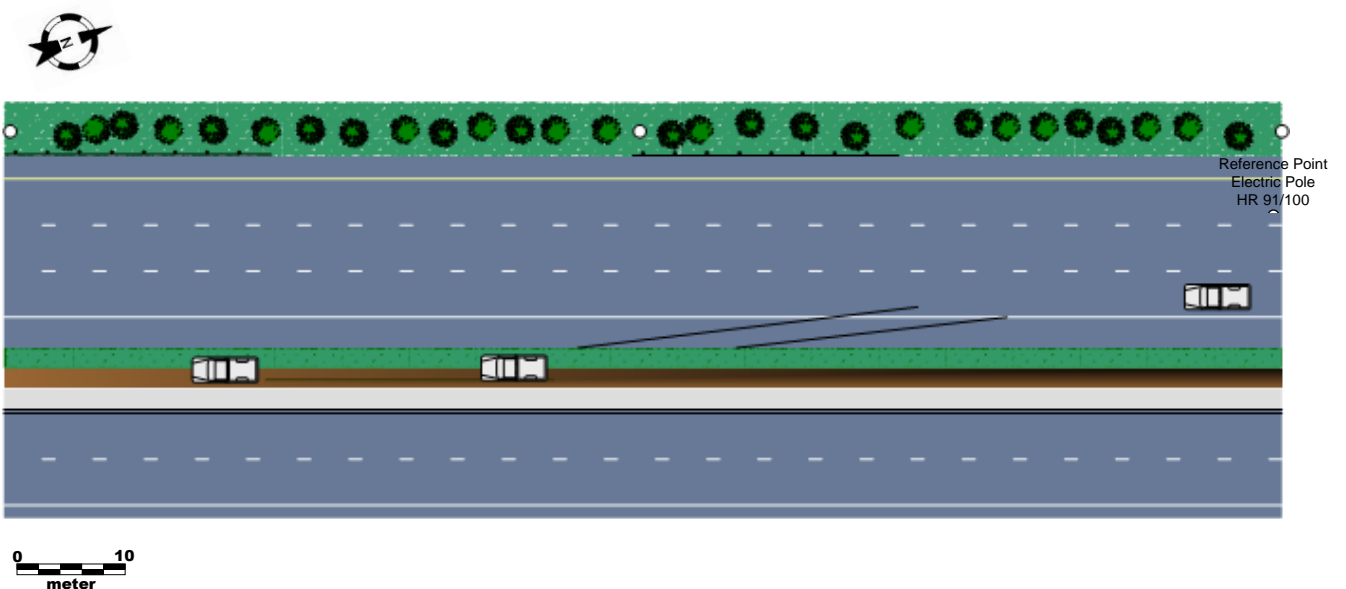


Figure 3-2: Collision Diagram

Vehicle Information

Isuzu D-max SLX 3.0 Di Turbo was a pick-up having a curb weight of 1,530 kg. It was silver in its body color with a cab behind the 2-seat in the passenger compartment without covered loading bed. It was manually transmitted without ABS. There was no cargo in the loading bed at the back.

Damage

The left side of the vehicle came in contact with the concrete side linings of the ditch. The cover of left side mirror was pushed inward and the cover of the left rear light (at the upper corner) was broken. There were several scratch marks on the left side of the body varying from 70 cm to 110 cm from the ground. **Figure 3-3** shows the major scratch marks on the body-structure. Finally, the crashed vehicle required to be towed from the crash scene by a towing vehicle.

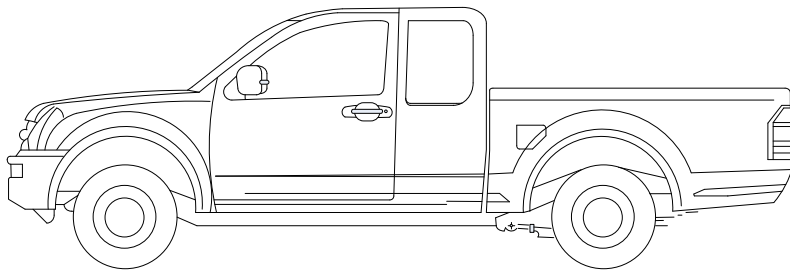


Figure 3-3: Different Levels of Scratch Marks from Ground

The left tire was found completely blown out without any visible rupture as shown in **Figure 3-4**. The mud on the alloy-wheel assembly clearly showed that the air was completely out as found at its POR. The pressure readings from the other three tires were found quite fluctuating. The right-front tire was 24 psi, left-rear 28 psi and right-rear 35 psi. The tread depth of the tire was found to be not very satisfactory for a pickup. All the tires had a 5 to 6 mm deep tread. Since the vehicle went down into the ditch's left side of the left-most lane, the front and rear wheels were marked with mud and worn-out grasses.



Figure 3-4: Blown out Left-Front Tire without Rapture

The vehicle was found at the rest position (i.e. POR) on the roadside embankment. Considering the roll-over, the vehicle made one-eighth of a full turn counter clock-wise from the initial condition to the POR. **Figure 3-5** shows the POR of the vehicle partially inside of ditch.



Figure 3-5: Point of Rest of the Vehicle partly in the Ditch

Driver Information

The driver had a driving experience of two years. However, he revealed only one week of driving experience with his own vehicle, the one involved in the crash. . According to his statement, he uses this route with this vehicle once a month making the same origin-destination trip. The duration of the journey is estimated to be two and half hour. From the crash scene the remaining time to the destination, Bang Na, was roughly two hours. The driver claimed to be attentive and under normal driving conditions. It was found during the investigation process that no alcohol was consumed before or during the trip.

Highway Information

The crash occurred on the south approach of Highway No.1 in Klong Luang, Pathumthani. 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, again Nakhonsawan, 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.

At the area of the crash, the road is a straight level section with a 4% cross slope measured at KM.41+100 where the run-off road crash occurred. The road was dry with its asphalt surface having been very recently resurfaced. The measured coefficient of friction equals 0.84. The surface of the ditch was mixed with mud and gravel. There was a ditch separating the highway and the frontage road with no protection. The slope of the grassy roadside embankment was approximately 15% while that of left shoulder was 4%.

Physical Evidences

The 20.90 m. and 26.60 m. long skid marks for left and right wheels respectively were found starting from the left shoulder to the roadside embankment (**Figure 3-6**). However, the marks were also found to be continuing inside the ditch about 33.00 m. further and stopped at the point of rest. The total length of the tire marks found indicated that the distance traveled by the errant vehicle from the shoulder to the point of rest was about 57.30 m.

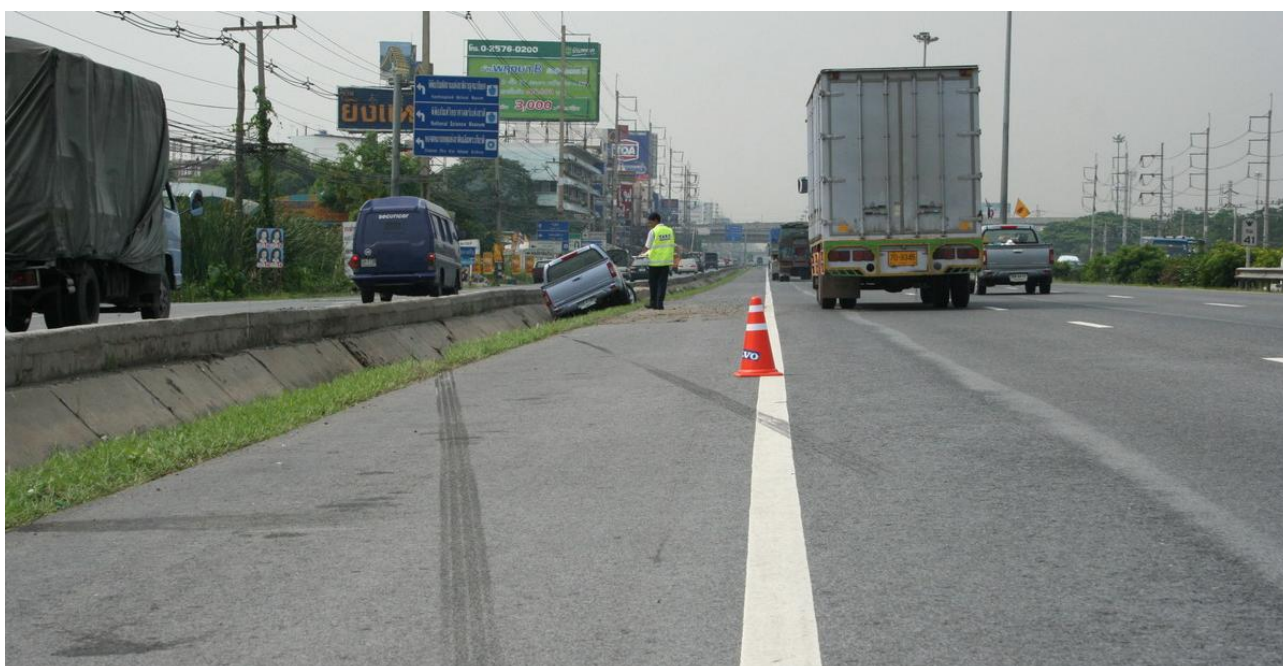


Figure 3-6: Evidences at Crash Scene

Accident Contributing Factors

Blown tire

The zero tire pressure of the front-left wheel initially caused the driver to lose control of the vehicle and run into the ditch on the left side of the travel direction. The tire's condition, i.e. tread depth was not satisfactory, indicating poor maintenance. In addition, the tire's pressure was imbalanced, showing variable pressures at different tires.

Injuries to the occupant

There was no report of injury to the driver. However, considering the speed transition from the start of the road run-off (102 km/h) to the moment the left wheel landed in the ditch (68 km/h), the force dissipated to the vehicle was determined to be about 12.81 kN. The duration was calculated to be 1.24 sec over such distance. Since no object was hit by the vehicle on its way entering the ditch, this force generated during such a short time did not result in any severe injury to the occupant. The calculation shows that another 2.81 sec elapsed from the left wheel's impact in the ditch to the stop at the point of rest. The force

dissipated to the vehicle was 10.47 kN during this time. No evidence of contacts between the occupant and the interior of the vehicle was found. **Figure 3-7** shows the driver's seating position.



Figure 3-7: Interior of the Vehicle (Driver side)

Speed Estimation

After applying the concept of reconstruction, the speed and time required from the run-off to the POR were calculated. Assuming that the average perception reaction time for a complex situation is 1.5 sec (Castel and Moss, 1999), PIEV distance was found to be 43.75 m. while the braking distance was estimated to be 57.35 m. The different friction surface speed was calculated based on the trajectory equations. Interpreting in reverse direction, the pickup was at the point of rest with zero speed decelerated from 68 km/h in the ditch. While in the transition zone, it decelerated to 68 km/h from 77 km/h at the road-side area. Considering further backward, it decelerated to 77 km/h from the initial traveling speed of 105 km/h when it traveled on the shoulder. The total distance traveled from the perception to the point of rest was estimated to be 101.1 m.

Ditch

The steep roadside embankment was not safe for any errant vehicle driver to recover in case of a road run-off that could have resulted in a severe roll-over. The detailed analysis of the clear zone concept, including findings from other cases, is comprehensively discussed in topic 5.2.

Significant Factors

TARC determined that the probable cause of the 060407-01 crash occurrence was the front-left tire blown out condition. The roadside design is another very important issue to be considered. Errant driver-friendly roadside design is one of the potential deficits in this run-off the road crash.