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Special Crash Investigations On-Site Rollaway/Backover Investigation Vehicle: 2002 Dodge Ram Location: Illinois Crash Date: May 2017

DISCLAIMER

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12. Sponsoring Agency Name and Address National Highway Traffic Safety Administration 1200 New Jersey Avenue SE Washington, DC 20590		*13. Type of Report and Period Covered* Technical Report Crash Date: May 2017 *14. Sponsoring Agency Code*	
15. Supplementary Note An investigation of the fatal backover of a 2-year-old male during the rollaway of a 2002 Dodge Ram. Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team.			
16. Abstract This report documents the on-site investigation of the rollaway/backover crash of a 2002 Dodge Ram 2500 Quad Cab pickup that resulted in fatal injuries to a 2-year-old male passenger. The Dodge was shifted out of park by the child while the vehicle was unattended by its driver. The child subsequently fell out the left front door as it rolled down a negative grade and the Dodge backed over him. The crash was reported to the National Highway Traffic Safety Administration by the police investigator in May 2017. The on-site SCI investigation consisted of the inspection of the Dodge for physical damage and to determine the operation of the automatic transmission shift pattern. The physical plant of the crash site was inspected, photographed and documented by total station. Details of the incident were gathered from the police through interviews. It was determined through the course of the investigation that the 2002 Dodge Ram was not equipped with a brake transmission shift interlock which may have aided to mitigate the crash. Federal Motor Vehicle Safety Standard No. 114 regulating the BTSI did not become a requirement until the 2010 Model Year.			
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Special Crash Investigations
Case No: CR17013
Office of Defects Investigation
On-Site Non-Traffic Surveillance Rollaway/Backover Investigation
Vehicle: 2002 Dodge Ram 2500 Quad Cab
Location: Illinois
Crash Date: May 2017

BACKGROUND

This report documents the on-site investigation of the rollaway/backover crash of a 2002 Dodge Ram 2500 Quad Cab pickup (**Figure 1**) that resulted in fatal injuries to a 2-year-old male passenger. The Dodge was shifted out of park by the child while the vehicle was unattended by its driver. The child subsequently fell out the left front door as it rolled down a negative grade and the Dodge backed over him. The crash was reported to the National Highway Traffic Safety Administration by the police investigator in May 2017 and was subsequently forwarded to the Special Crash Investigations (SCI) team. The SCI team contacted the investigating officer to coordinate an inspection of the vehicle. The on-site inspection of the Dodge and crash site took place in May 2017.

Figure 1: South-facing image depicting the Dodge at rest in the retention pond. Image obtained from an online news source.

The rollaway and backover occurred during the morning on a two-lane street in a residential setting. News reports indicated that the 29-year-old female driver was transporting her 2-year-old son for daycare to the home of the child's grandmother. The driver stopped the vehicle on the road in front of the residence and exited the Dodge while the engine remained running. As the driver exited the vehicle, the child moved from the second row into the driver's position and shifted the transmission from park to neutral. The Dodge began rolling backwards, knocking down the driver, and then continued down the grade of the road. The child fell from the cab and was backed over by the front left tire. The Dodge continued down the grade into a neighboring property, striking a landscape wall. The Dodge then rolled forward into, and along, an intersecting road. The Dodge departed the left road edge, striking a mailbox, and entered a retention pond where it came to final rest.

The on-site SCI investigation consisted of the inspection of the Dodge for physical damage and to determine the operation of the automatic transmission shift pattern. The physical plant of the crash site was inspected, photographed, and documented by a Nikon Nivo total station. Details of the incident were gathered from the police through interviews. It was determined through the course of the investigation that the 2002 Dodge Ram was not equipped with a brake transmission

shift interlock (BTSI) which may have aided to mitigate the crash. Federal Motor Vehicle Safety Standard (FMVSS) No. 114, Theft Protection, regulating the BTSI did not become a requirement until the 2010 Model Year (earlier versions of FMVSS 114 did not address BTSI).

CRASH SUMMARY

Crash Site

This incident occurred in a residential neighborhood in the morning. At the time of the incident, the National Weather Service reported the conditions as clear and dry with a temperature of 15.5 ºC (60 ºF), 62 percent humidity, and winds out of the southwest at 22 km/h (13.8 mph).

The driver of the Dodge approached the site by traveling south on a residential street. This north/south oriented street was 7.9 m (26. 0 ft) in width and was bordered by 15 cm (6.0 in) tall concrete barrier curbs with cutouts for residential driveways. There were no markings on the asphalt surface to regulate traffic. The street was straight with an average grade of 7.6 percent positive to the south. Curbside mailboxes were present at each house location. There were no sidewalks and no restrictions for curbside parking**. Figure 2** is a lookback view of the approximate parked position of the Dodge and its rollaway trajectory.

Figure 2: Lookback view in the northerly direction of the parked position of the (south-facing) Dodge and its rollaway trajectory.

Located 50 m (164 ft) north of the driver's destination (its parked position) on the north/south street was a four-leg intersection with another residential street. At the northwest quadrant of the intersection was a lawn area with a positive slope of 15 percent. A landscape wall that was 33 cm (13.0 in) in height was constructed of precast concrete blocks was located within this lawn area **(Figure 3)**.

Figure 3: Northwesterly view of the struck landscape wall and the rollaway trajectory of the Dodge.

The east/west leg of the intersection was 7.7 m (25.3 ft) in width and had an average grade of 2.1 percent, negative to the east. This street was straight in the area of the intersection (**Figure 4**), however, the east leg transitioned to a gradual right curve 65 m (213 ft) east of the intersection. A retention pond was located north of the east

leg of the intersection at the bottom of a lawn area having a negative slope of 25 percent **(Figure 5)**. The shallow pond was the final rest position of the rollaway Dodge.

Figure 4: Eastward view of the intersection with the retention pond located in the upper left quadrant of the image.

Figure 5: Eastward trajectory view of the Dodge from its road departure toward the retention pond.

Lawn areas bordered all section of the streets and intersection. Stop signs were positioned at the southwest and northeast quadrants of the intersection regulating traffic flow in the east and westbound travel direction. North/southbound traffic through the intersection was not controlled. The speed limit in the residential area was 40 km/h (25 mph). The intersecting roadways and the residential area were mapped using a Nikon Nivo total station. A crash diagram is included at the end of this technical report.

Pre-Crash

The 29-year-old pregnant female driver was transporting her 2-year-old child to her mother's residence, where the child's grandmother provided daycare. The child was restrained by the 5-point harness system of a Graco forward-facing child restraint system (CRS) in the second row center position of the Dodge during the transport. As the driver entered the subdivision of her mother's residence, she was traveling south on the two-lane street with an average grade of 7.6 percent, positive to the south. She stopped and parked the Dodge facing south along the east curb at the north edge of the driveway at her destination. The driver placed the column-mounted transmission selector lever in the park position. The engine of the Dodge remained running, as she turned to her right and reached over the center armrest (center seat back rest was folded forward to form a center console) to unbuckle the 5-point harness system of the CRS. Due to her stature and (8.5-month) pregnancy, she had difficulty reaching the CRS from outside the vehicle.

The driver opened the left front door and exited the Dodge. As she exited the vehicle, she then opened the rear-hinged left rear door to provide egress for her child. During that time, the child

exited the CRS and climbed over the center console and entered the driver's seat. He grabbed the column-mounted transmission selector lever and shifted the transmission from the park position to an unknown position. The driver immediately reached in and placed the shift lever back into the park position. However, the child again reached and grabbed the shifter and placed the transmission in the neutral position while the engine remained running with the key/ignition in the run position. In this ignition position, the transmission selector lever and steering wheel were in an unlocked condition. (The subsequent SCI inspection determined that the vehicle's transmission did not have a brake transmission shift interlock.)

Crash

After the child shifted the transmission into neutral, the Dodge began to roll rearward to the north, aided by gravity and the negative 7.6 percent grade of the street. The driver, standing on the pavement adjacent to the opened left rear door, was knocked down onto the asphalt road surface (Event 1). She immediately stood up, but felt dizzy and fell a second time onto the pavement. The Dodge continued to roll rearward away from the driver. The sidewalls of the right side tires of the Dodge were rubbing against the concrete curb; the curb kept the vehicle rolling in a straight line in a northerly direction downhill. Black transfer marks were noted along the vertical face of the curb from the tire contact. Approximately 25 m (82 ft) from the initiation of the rollaway, the child fell out of the vehicle onto the street. The left front tire overrode the child's head (Event 2) resulting in fatal injuries. This event did not alter the speed or trajectory of the vehicle.

As the Dodge approached the four-way intersection, the right side tires disengaged the curb at the southwest quadrant of the intersection and the vehicle traversed the intersection, arcing in a counterclockwise direction. The oversize tires easily overrode the 15 cm (6.0 in) curb at the northwest quadrant of the intersection and the Dodge entered a lawn area with a slope of 9.3 percent positive in the direction of the vehicle's backing trajectory.

The Dodge rolled up the slope of the lawn approximately 8.8 m (29 ft). The back plane of the Dodge traveled over the 33 cm (13.0 in) tall landscape wall and its rear differential struck the concrete blocks (Event 3). The combination of rolling up the slope and the force of the impact caused the Dodge to come to a momentary stop. The landscape wall displaced by the force of the impact had been rebuilt at the time of the SCI inspection.

Due to the negative 15 percent grade and the neutral position of the transmission, the Dodge then began to roll forward as it reentered the intersection heading in an easterly direction. The vehicle rolled into the east leg of the intersection on a counterclockwise arcing trajectory. The average grade along this trajectory was 2.1 percent negative to the east. The Dodge traveled approximately 42 m (138 ft) after disengaging the landscape wall and overrode the north curbline of the east leg of the intersection.

The front plane of the Dodge struck and fractured a wooden mailbox post located at this residence (Event 4). This impact did not slow or alter the rollaway trajectory of the Dodge. Rotating tire prints on a lawn area evidenced the vehicle trajectory as it traversed the lawn for a distance of 29 m (95 ft). The grade of the lawn was 25 percent negative in the northeasterly direction. The Dodge entered a shallow retention pond located 12 m (39 ft) north of the north curb of the east intersection leg. The Dodge came to rest in the retention pond with its engine still running at idle.

Post-Crash

Police were dispatched to a call of a disturbance at the location of the backover crash. The caller heard people screaming at the location; however the caller did not know the reason for the disturbance. On arrival, police found the driver of the Dodge holding the child non-motorist on the lawn area of the residence with her mother standing by. The officer noted that blood was exuding from the child's nose, mouth and left ear. He immediately took the child from the driver and placed the child on the ground and began administering cardiopulmonary resuscitation (CPR) chest compressions. Within minutes, firefighters, paramedics and additional police officers arrived on-scene. Paramedics placed the child on a backboard and continued the CPR activities.

An officer was advised that the Dodge was in a pond off the adjacent street and that the engine was running. This officer climbed into the cargo bed of the truck and over the left side and entered the vehicle through the driver's door. He noted the truck was unoccupied with the engine running and the transmission out of the park position. He was not able to recall the position of the transmission selector lever prior to placing the transmission in park. It was reported to SCI that he was able to turn off the vehicle and remove the key. His method to shut down the engine was not determined by SCI. The officer exited the vehicle and returned to the site of the initial incident of the backover to offer assistance with the investigation.

The child was transported by ambulance to a local hospital where he was evaluated and pronounced deceased approximately 30 minutes after the rollaway incident. The driver of the Dodge was transported to the hospital by private vehicle. She was later evaluated at the hospital for the safety of her pregnancy and the emotional duress she had encountered. The child's body was released to the coroner's office for autopsy.

2002 DODGE RAM 2500 QUADCAB

Description

The involved vehicle in this rollaway/backover crash investigation was a 2002 Dodge Ram 2500 series long-bed pickup truck **(Figure 6)**. The Dodge was manufactured in February 2002 and was identified by the Vehicle Identification Number 3B7KF23602Mxxxxxx. Manufactured as a quad cab with C-pillar hinged rear doors, the Dodge did not have a fixed B-pillar as the doors opened to provide full-access to the vehicle's cab. The powertrain was a 6-cylinder Cummins turbo diesel engine with a displacement of 5.9 liters linked to a 4-speed automatic transmission with a column-mounted transmission and 4-wheel drive. A separate transfer case shift lever was floor-mounted to the left side of the center tunnel. The gross vehicle weight rating was 3,992 kg (8,800 lb) with gross axle weight ratings of 2,359 kg (5,900 lb) front and 2,760 kg (6,084 lb) rear. The Dodge was equipped with power-assisted disc brakes with ABS and electronic brakeforce distribution. Steering was power-assisted and speed sensitive. The vehicle manufacturer recommended tires sized at LT245/75R16 with cold tire pressures of 448 kPa (65 PSI) for the front axle and 551 kPa (80 PSI) for the rear axle. At the time of this incident, the Dodge was equipped with oversize Nitto Terra Grappler tires of size LT315/75R16. In addition to the oversize tires, the Dodge was equipped with a supplemental air-ride rear suspension with the air bags mounted forward of the rear axle. The height of the door sills of the Dodge were 56 cm (22 in) above the pavement. Although not directly involved in the pedestrian backover, the ground clearance of the rear differential was 23 cm (9.1 in).

Figure 6: Left plane view of the 2002 Dodge 2500 Quad Cab pickup truck.

The Dodge was equipped with an aftermarket diesel fuel cut-off switch located on the left aspect of the lower left instrument panel **(Figure 7)**. The cable-pull fuel shut-off was configured and installed to allow the Dodge to continue to run with the key in the off-position and removed from the vehicle. At the time of the SCI inspection, the fuel cut-off was the only method to stop the engine. Three aftermarket gauges were mounted to the left A-pillar that provided the driver with performance data of the vehicle's turbo-engine.

Figure 7: Aftermarket cable-pull fuel cut-off in the Dodge.

The interior of the Dodge Quad Cab pickup truck was configured with front bucket seats and a flip and fold center console. At the time of this incident, the backrest was folded forward and used as a center console/armrest. The second row seat was a forward-facing bench with a forward-folding seat back. The forward-facing Graco CRS was installed the in the second row center position. All seating surfaces were leather. **Figure 8** is an interior view of the Dodge with the left doors open.

Figure 8: Interior view of the Dodge with the left doors in the open positions.

Safety systems consisted of seatback integrated 3-point manual seat belts for the driver and front row right positions, and C-pillar-mounted seat belts for the second row left and right positions. The center positions of the front and second rows were equipped with lap belts.

Supplemental protection was provided to the driver and front row right positions by dual-stage frontal air bags. The driver's frontal air bag was located in the center hub of the steering wheel while the passenger's frontal air bag was mounted in the right mid instrument panel. A manual key activated cut-off switch for the passenger's frontal air bag was mounted in the upper aspect of the center instrument panel. At the time of the SCI investigation, the passenger's frontal air bag was switched to the "Air Bag On" position.

Vehicle History

The Dodge was recently purchased by the driver and her husband. The 29-year-old female driver had limited familiarity with the vehicle prior to this incident. The vehicle modifications addressed above were completed prior to the change of ownership. The Dodge was formerly used by a volunteer firefighter and the fuel cut-off system was installed to allow the vehicle to idle while unattended for extended periods of time during response to emergency calls.

Exterior Damage

The Dodge did not sustain residual exterior damage from the events associated with this crash. The first event involved contact between the open left front door of the Dodge and the adult driver who is considered to be a non-motorist because she was standing outside the vehicle. Therefore, this first event was outside the scope of the Collision Deformation Classification (CDC) and was coded as unknown (99999999). The CDC descriptive of the backover of the child non-motorist by the left front tire (event 2) was 06BLWN09. The third event involved the rear differential housing contact with the landscape wall. The lower aft aspect of the differential was scuffed from contact with the concrete blocks forming the wall. The CDC assigned to this

impact was 00UDCN1. The center aspect of the front bumper struck and fractured a 10x10 cm (4x4 in) mailbox post. The impact (event 4) did not produced evidence of contact to the bumper surface. The CDC representing this impact was 12FLCU1.

Event Data Recorder

The Dodge was not equipped with an event data recorder (EDR) supported by the Bosch Crash Data Retrieval tool; therefore, there is no EDR data relative to this investigation.

Interior

The interior of the Dodge was not damaged or directly involved in this incident as it was unoccupied and there was no deployment of the frontal air bag system. There was no exterior damage to produce occupant compartment intrusion.

Ignition Switch

The 2002 Dodge was configured with a keyed ignition switch conventionally mounted to the right side of the steering column **(Figure 9)**. At the time of the SCI inspection, the key was removed from the ignition and the transmission was placed in the park position with the column locked for both steering and transmission selection functions. On entry to the vehicle through the left front door, no audible warnings were provided. The dome light was illuminated.

Figure 9: Keyed ignition switch of the Dodge in the lock position.

As the key was inserted into the ignition in the lock position with the left front door opened, an audible warning sounded in a repeating chime. As the left front door was closed, the chime ceased. The transmission selector lever remained locked. Depressing the brake did not release the transmission.

The key/ignition switch was rotated counterclockwise to the accessory position. This was the only position upon counterclockwise rotation of the ignition switch. In this position, the radio would play, an audible chime sounded with the left front door open. The audible warning ceased when the door was closed. The key could not be removed from the ignition switch and the transmission selector lever remained locked. Engaging the brake pedal did not release the transmission selector lever.

Next, the key/ignition switch was rotated clockwise to the first position forward of the lock position. In this position, the transmission selector lever unlocked and the audible chime sounded

with the door open and the dome light illuminated. The instrument panel lights did not illuminate. This position of the ignition switch was designed for towing the vehicle. It should be noted that the brake pedal did not need to be engaged prior to shifting the transmission from the park position.

Next, the key/ignition switch was rotated clockwise to the run position - two positions forward of the lock position. In this position, the instrument panel warning lights illuminated, the transmission selector lever remained locked, and there was no audible warning chime with the left front door in the open position. Depressing the brake pedal did not release the transmission selector lever.

Next, the SCI investigator rotated the key/ignition switch clockwise to the start position. This started the engine and release of the key provided an automatic return to run-position. The engine would only start with the transmission selector lever placed in the park or neutral positions. Once the engine was running, the brake pedal was not required to shift the transmission to any of the six (P R N D 2 1) positions. The transmission shifted by pulling the lever rearward (past a detent) and then down.

Brake Transmission Shift Interlock

The 2002 Dodge Ram was not equipped with a brake transmission shift interlock (BTSI). The brake pedal was not required to be engaged to shift the column-mounted transmission selector lever from the park position with the keyed ignition switch turned clockwise to the first detent or the run position after the engine was started. That part of FMVSS No. 114 regulating the BTSI did not become a requirement until the 2010 model year. The 2002 Dodge Ram was only equipped with a theft protection interlock.

Manual Seat Belt Systems

The Dodge was equipped with manual seat belt systems for the six occupant positions. The front row left and right positions were equipped with 3-point lap and shoulder belt systems integrated into the seat backs and configured with sliding latch plates. The driver's seat belt used an emergency locking retractor (ELR) while the front row right was a switchable ELR/automatic locking retractor (ALR). The second row left and right positions were equipped with 3-point lap and shoulder belt systems with sliding latch plates and C-pillar-mounted ELR/ALR retractors. The front row and second row center positions were equipped with 2-point lap belt systems. The second row center lap belt was used to secure the CRS to the vehicle.

Supplemental Restraint Systems

The Dodge was equipped with dual-stage frontal air bags for the driver and front row right occupant positions. The driver's frontal air bag was concealed in the center hub of the steering

wheel while the passenger's frontal air bag was a mod-mount design in the right instrument panel. The minor severity crash events did not warrant deployment of the air bag system.

Child Restraint System

The 2-year-old male non-motorist was initially restrained in a Graco Nautilus 65 child restraint system. The Graco Nautilus 65 was designed as a 3-in-1 forward-facing-only CRS that could be used as 5-point harness system, a high-back booster, or a backless booster. During its use in this incident, the CRS was installed and used as a 5-point harness system. CRS manufacturer specifications listed the forward-facing CRS for use of children weighing 10 to 29 kg (22 to 65 lb). The CRS was installed in the second row center position and was secured to the vehicle by the manual lap belt routed through the forward-facing belt path **(Figure 10)**.

Figure 10: The CRS installed in the second row center position of the Dodge.

2002 DODGE RAM 2500 NON-MOTORISTS

Adult Non-Motorist Demographics

Age / Sex:	29 years/female (8.5 months pregnant)
Height:	157 cm (62 in)
Weight:	Unknown
Eyewear:	Yes
Seat Type:	None, exited vehicle prior to the crash
Seat Track Position:	Not applicable
Manual Restraint Usage:	Not applicable
Usage Source:	Not applicable
Air Bags:	Not applicable
Alcohol/Drug Involvement:	None
Egress From Vehicle:	Outside vehicle at time of rollaway crash
Transport From Scene:	Precautionary ambulance transport to a local hospital
Medical Treatment:	Examined and released

Adult Non-Motorist Injuries

Injury No.	Injury	AIS 2015	Involve Physical Component	IPC Confidence Level
N/A	None	None	None	None

Source: Investigating police

Adult Non-Motorist Kinematics

Prior to the rollaway crash, the 29-year-old female was transporting the 2-year-old child to a residence where the child's grandmother provided daycare. The 2-year-old male was seated in a forward-facing CRS in the second row center position of the Dodge. The Dodge entered the subdivision where the home was located traveling south on a two-lane street. The roadway had a 7.6 percent grade, positive to the south, at that location. The driver stopped the vehicle on the roadway in front of the house and placed the transmission of the Dodge into park.

While the engine remained running, the driver turned to her right and unbuckled the 5-point harness of the CRS. Due to her short stature and her pregnancy it was difficult for her to reach the CRS from outside the Dodge. She then turned to her left and exited the vehicle through the left front door. The driver then opened the rear-hinged left rear door.

During this time, the child exited the CRS and climbed forward over the center console, and into the driver seat. He grabbed the transmission lever and shifted the lever. The driver immediately reached in and placed the shift lever back into the park position. However, the child again reached and grabbed the shifter a second time and placed the transmission into the neutral position.

The Dodge began to roll backward. The driver was struck and knocked off balance by the open left front door and fell to the ground. The driver reported that as she stood up, she felt dizzy and fell and a second time. She then reported that as she turned, she saw the backover crash occur.

Child Non-Motorist Demographics

Age / Sex:	2 years/male
Height:	91 cm (36 in)
Weight:	12 kg (27 lb)
Eyewear:	None
Seat Type:	Initially seated in a forward-facing CRS in second row center position, exited CRS and climbed into driver seat
Seat Track Position:	Not applicable
Manual Restraint Usage:	Not applicable
Usage Source:	Not applicable
Air Bags:	Not applicable
Alcohol/Drug Involvement:	None
Egress From Vehicle:	Fell out the front left door
Transport From Scene:	Ambulance to a local hospital
Medical Treatment:	None – fatally injured

Child Non-Motorist Injuries

Injury No.	Injury	AIS 2015	Involved Physical Component	IPC Confidence Level
1	Extensive midbrain lacerations	140212.6	Vehicle tire	Certain
2	Extensive cerebellum lacerations	140474.3	Vehicle tire	Certain
3	Extensive cerebrum lacerations involving temporal and parietal lobes	140688.3	Vehicle tire	Certain
4	Diffuse subarachnoid hemorrhage superiorly and inferiorly	140693.2	Vehicle tire	Certain
5	Pituitary laceration	140799.3	Vehicle tire	Certain
6	Hinge fracture of the skull base with fractures of all cranial fossa	150206.4	Vehicle tire	Certain
7	Fragmentation of the skull	150404.3	Vehicle tire	Certain
8	Mandible fracture	250600.1	Vehicle tire	Certain
9	Maxilla fracture	250800.2	Vehicle tire	Certain
10	Nasal skeleton fracture	251000.1	Vehicle tire	Certain
11	Multiple bilateral rib fractures, right 3-6 posteriorly, left 2-7 posteriorly	450203.3	Vehicle tire	Certain
12	Right hemothorax	442200.3	Vehicle tire	Certain
13	Posterior bilateral lung contusions	441410.3	Vehicle tire	Certain
14	Diffuse left subgaleal hemorrhage	110402.1	Vehicle tire	Certain
15	Diffuse right subgaleal hemorrhage	110402.1	Vehicle tire	Certain
16	Left scalp abrasions, 4.5 inch area temporal and parietal region	110202.1	Ground	Certain
17	Entire left side of face is abraded, inclusive of the forehead, ear, chin, cheek and nose	210202.1	Ground	Certain
18	Left neck abrasions	310202.1	Ground	Certain
19	Chest contusions - left subclavian	410402.1	Ground	Certain
20	Chest abrasions - left subclavian	410202.1	Ground	Certain
21	Left flank 1-inch abrasion	410202.1	Ground	Certain
22	Right upper back contusions - crisscrossing, linear resembling tire tracks	410402.1	Vehicle tire	Certain
23	Right upper arm contusions – crisscrossing, linear resembling tire tracks, back and lateral side	710402.1	Vehicle tire	Certain
24	Left shoulder contusions	710402.1	Ground	Certain

Injury No.	Injury	AIS 2015	Involved Physical Component	IPC Confidence Level
25	Left shoulder abrasions	710202.1	Ground	Certain
26	Left upper arm contusions	710402.1	Ground	Certain
27	Left upper arm abrasions	710202.1	Ground	Certain
28	Left elbow 0.5-inch abrasion	710202.1	Ground	Certain
29	Right hand abrasion – dorsal surface. 3-inch area	710202.1	Ground	Certain

Source – Coroner's Report (internal)

Child Non-Motorist Kinematics

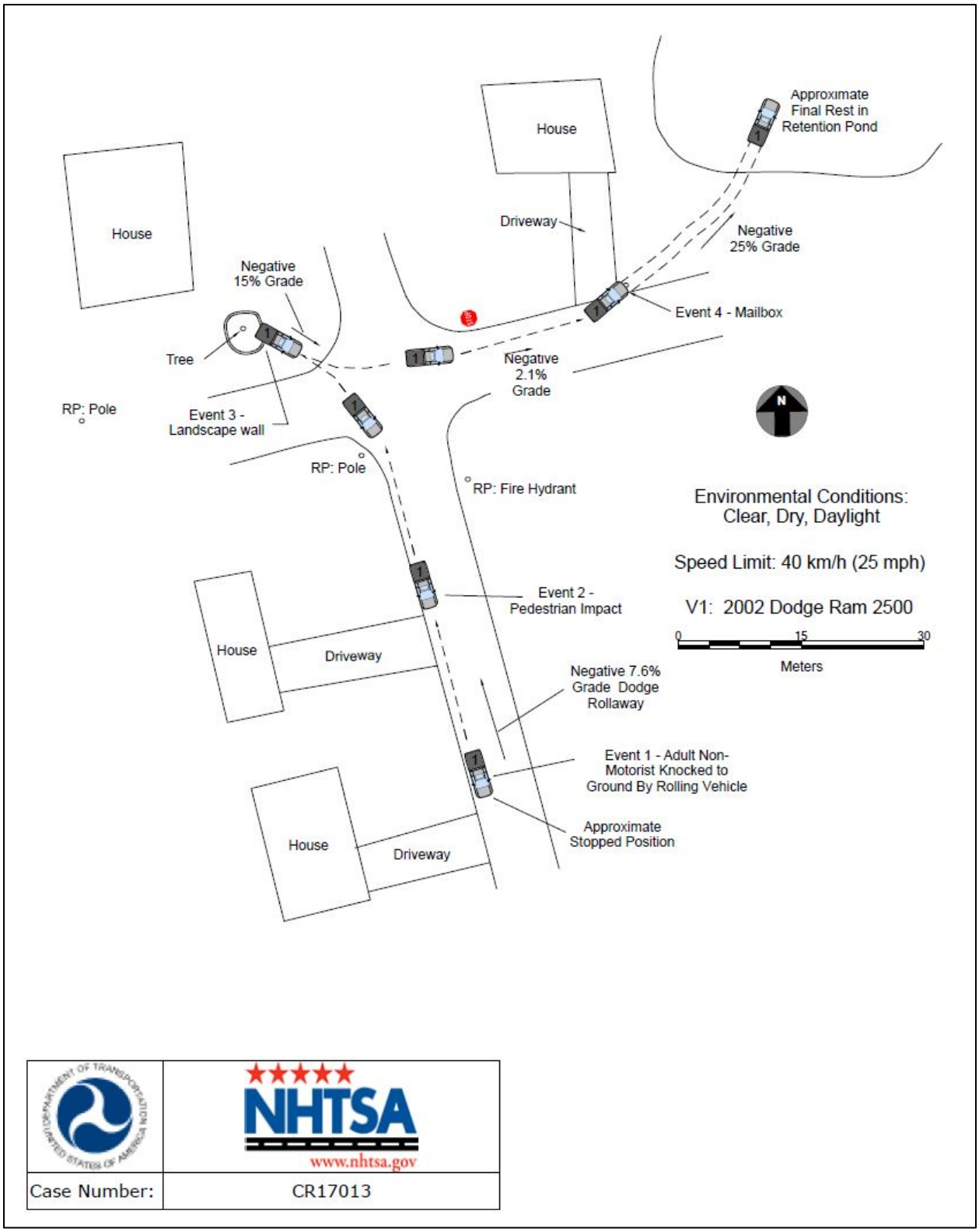
The child was initially secured by the 5-point harness of the CRS in the second row center position of the Dodge as the driver operated the vehicle. The driver stopped the vehicle in front of the house and shifted the transmission into park. While the engine remained running, the driver turned to her right, reached over the center console between the seats, and unbuckled the harness system of the CRS.

As the driver exited the vehicle through the left front door, the child climbed forward over the center console and into the driver seat. The child grabbed the steering wheel and transmission selector lever and shifted the transmission. The driver immediately reached in and placed the lever back into park. The child then shifted the lever a second time into neutral.

The Dodge began to roll backward down the grade of the roadway. The driver was knocked to the ground by the open left front door. Uncontrolled, the vehicle continued to roll away down the street. After approximately 25 m (82 ft) of movement, the child apparently attempted to exit the vehicle through the left front door and fell to the street.

The left front tire of the Dodge rolled over the head and torso of the child. The injury pattern suggested that the child was face down with the left side of his head toward the pavement. The weight of the vehicle compressed the child to the ground resulting in multiple soft tissue abrasions and contusions, the multiple skeletal fractures and fatal brain injuries identified by autopsy.

CRASH DIAGRAM



APPENDIX A:

NON-TRAFFIC SURVEILLANCE FORMS

Not Applicable ☐

U.S. Department of Transportation
National Highway Traffic Safety Administration

SCENE FORM

Special Crash Investigations
Non-Traffic Surveillance

1. Case Number

C R 1 7 0 1 3

IDENTIFICATION

2. Date of Crash 0 5 / x x / 1 7

3. Time of Crash 9 9 9 9

Code reported military time of crash.

NOTE: Midnight = 2400
Unknown = 9999

AMBIENT CONDITIONS

4. Light Conditions

- ☉ Daylight
- ☐ Dark
- ☐ Dark but lighted
- ☐ Dawn
- ☐ Dusk
- ☐ Unknown

5. Atmospheric Conditions
(Select all that apply)

- ☉ Clear-No adverse conditions
- ☐ Cloudy
- ☐ Rain
- ☐ Snow
- ☐ Fog, Smog, Smoke
- ☐ Sleet, Hail (freezing rain or drizzle)
- ☐ Blowing Snow
- ☐ Severe Crosswinds
- ☐ Blowing Sand, Soil, Dirt
- ☐ Other (specify):_____
- ☐ Unknown

6. Temperature

- ☐ Below 0 degrees Celsius (Below 32 F)
- ☐ 1-10 degrees Celsius (33-50 F)
- ☉ >10-24 degrees Celsius (51-75 F)
- ☐ Over 24 degrees Celsius (Over 75 F)
- ☐ Unknown

SCENE INFORMATION

7. Type of area in which crash occurred
(Select all that apply)

- ☉ Single family residential
- ☐ Row houses/townhouses
- ☐ Multi family housing
- ☐ Commercial
- ☐ Industrial
- ☐ Rural
- ☐ Unknown

8. Driver exterior sightline obstructions
(Select all that apply)

- ☉ None
- ☐ Other vehicles
- ☐ Building
- ☐ Trees
- ☐ Shrubbery
- ☐ Other (specify)_____
- ☐ Utility poles
- ☐ Signs
- ☐ Glare
- ☐ Unknown
- ☐ No driver present

9. Crash location

- ☐ Driveway
- ☐ Parking Lot
- ☐ Sidewalk
- ☐ Alley
- ☉ Road / street
- ☐ Roadside / shoulder
- ☐ Other (specify)_____
- ☐ Unknown
- ☐ Intersection of driveway and sidewalk

10. Non motorist sightline obstructions
(Select all that apply)

- ☉ None
- ☐ Other vehicles
- ☐ Building
- ☐ Trees
- ☐ Shrubbery
- ☐ Utility poles
- ☐ Signs
- ☐ Glare
- ☐ Other (specify) _____
- ☐ Unknown

11. Grade at parked position (+/-) + 0 8 %

12. Estimated distance from parked position to impact

0 0 1 . 0 m

13. Estimated speed at impact 0 0 5 kmph

14. Grade at impact (+/-) + 0 8 %

15. Estimated distance from impact to vehicle final rest

0 5 0 . 0 m

Unknown = 999 Reference Items 11,12, 13, 14, 15

Revised January 2018

Not Applicable ☐

U.S. Department of Transportation
National Highway Traffic Safety Administration

VEHICLE FORM

Special Crash Investigations
Non-Traffic Surveillance

1. Case Number C R 1 7 0 1 3

VEHICLE IDENTIFICATION

2. VIN 3 B 7 K F 2 3 6 0 2 M X X X X X X

3. Model Year 2 0 0 2

4. Vehicle Make (specify): Dodge

5. Vehicle Model (specify): RAM2500 Quadcab

GLAZING

Location	Presence (check)	Status (select)	Clarity (select)	Tint (check)	Glazing Obstructions (specify if present)
Windshield	☑	☑ Fixed / ☐ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☑ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☐	n/a
LF	☑	☐ Fixed / ☑ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☑ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☑	n/a
RF	☑	☐ Fixed / ☑ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☑ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☑	n/a
2nd Left	☑	☐ Fixed / ☑ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☑ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☑	n/a
2nd Right	☑	☐ Fixed / ☑ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☑ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☑	n/a
3rd Left	☐	☐ Fixed / ☐ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☐ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☐	
3rd Right	☐	☐ Fixed / ☐ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☐ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☐	
Backlight	☐	☐ Fixed / ☐ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☐ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☐	
Left Backlight	☐	☐ Fixed / ☐ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☐ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☐	
Right Backlight	☐	☐ Fixed / ☐ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☐ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☐	
Roof	☐	☐ Fixed / ☐ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☐ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☐	
Other (specify)	☐	☐ Fixed / ☐ Closed / ☐ Open / ☐ Partially Open / ☐ Unknown	☐ Clear / ☐ Hazy / ☐ Very Dirty / ☐ Unknown	☐	

TIRE DATA

6. Vehicle Manufacturer Recommended Tire Size LT245/75R16

7. LF Tire Size LT315/75R16

8. LR Tire Size LT315/75R16

9. RF Tire Size LT315/75R16

10. RR Tire Size LT315/75R16

Revised January 2018

Seats / Head Restraint Data

Seat Position	Seat Type (Select from below)	Head Restraint (Check if available)	Head Restraint Adjustment (select)
Front Left	1	☑	☐ Full Down / ☐ Mid / ☐ Full Up
Front Middle	0	☐	☐ Full Down / ☐ Mid / ☐ Full Up
Front Right	1	☑	☐ Full Down / ☐ Mid / ☐ Full Up
2nd Left	5	☐	☐ Full Down / ☐ Mid / ☐ Full Up
2nd Middle	5	☐	☐ Full Down / ☐ Mid / ☐ Full Up
2nd Right	5	☐	☐ Full Down / ☐ Mid / ☐ Full Up
3rd Left	0	☐	☐ Full Down / ☐ Mid / ☐ Full Up
3rd Middle	0	☐	☐ Full Down / ☐ Mid / ☐ Full Up
3rd Right	0	☐	☐ Full Down / ☐ Mid / ☐ Full Up

NOTES:

Integral head restraints

Seat Type codes:

0 = No seat or seat folded down
1 = Bucket
2 = Bucket w/ folding back
3 = Bench
4 = Bench with folding back cushions
5 = Bench w/ folding back
6 = Split bench w/ separate back cushions
7 = Split bench w/ separate folding back
8 = Pedestal (i.e. column supported)
9 = Box mounted (i.e. van type)
10= Other seat type (specify)
99= Unknown seat type

VEHICLE MEASUREMENTS

Clearance Heights	Measurements (all from ground, and in centimeters	NOTES
Beltline		
Top of trunk/tailgate		
Bottom of bumper	65	
Trailer hitch (if applicable)	57	
Undercarriage		
Sway bar		
Axle		
Differential	23	
Other (specify): Sill	56	
Sensor Height (if equipped)		
Camera Height (if equipped)		

Revised January 2018

Not Applicable ☑

Undo Not Applicable

U.S. Department of Transportation
National Highway Traffic Safety Administration

Back Up / Parking Aid Form

Special Crash Investigations
Non-Traffic Surveillance

1. Case Number

C R 1 7 0 1 3

PARKING AID PRESENCE

2. Type of backing/parking aid present

- ☐ OEM camera
- ☐ OEM ultrasonic/radar sensor
- ☐ OEM combination camera-ultrasonic/radar sensor
- ☐ OEM Fresnel lens
- ☐ OEM interior mirrors
- ☐ Aftermarket camera
- ☐ Aftermarket ultrasonic/radar sensor
- ☐ Aftermarket combination camera-ultrasonic radar sensor
- ☐ Aftermarket Fresnel lens
- ☐ Aftermarket interior mirrors
- ☐ Other (specify): _____

CAMERA INFORMATION

Specify field of view measurements on diagram

3. System make/model

_____

4. Video monitor type

- ☐ None present
- ☐ LCD (color)
- ☐ CRT (black & white)
- ☐ Unknown

5. Video display size _____ cm
(Diagonal)

6. Camera location

- ☐ None present
- ☐ Bumper
- ☐ License plate
- ☐ Tailgate/Hatch/Trunk
- ☐ Other (specify): _____

7. Video image quality under scene lighting conditions

- ☐ None present
- ☐ Good
- ☐ Average
- ☐ Poor (specify): _____
- ☐ Unknown

8. Was the camera functioning properly

- ☐ None present
- ☐ Yes
- ☐ No, poor image quality due to glare
- ☐ No, poor image quality due to atmospheric conditions
- ☐ No, camera turned off
- ☐ No, camera inoperable
- ☐ Unknown

ULTRASONIC/RADAR SENSOR

Specify object detection range on diagram

9. System make/model

_____

10. Auditory warning illumination

- ☐ No sensor present
- ☐ Yes
- ☐ No
- ☐ Unknown

11. Number of sensors ____

12. Sensor locations
(Select all that apply)

- ☐ No sensor present
- ☐ Left bumper
- ☐ Center bumper
- ☐ Right bumper
- ☐ License plate area
- ☐ Tailgate/Hatch/Trunk

13. Was warning system functioning properly

- ☐ No sensor present
- ☐ Yes, system alerted driver
- ☐ No, system did not alert driver
- ☐ No, system turned off
- ☐ No, system inoperable
- ☐ Unknown

Revised January 2018

14. Did driver react to warning

- ☐ No sensor present
- ☐ Yes
- ☐ No
- ☐ Unknown
- ☐ Sensor present, did not sound

15. Did driver report common false warnings

- ☐ No sensor present
- ☐ Yes
- ☐ No
- ☐ Unknown

Not Applicable

No Driver Present ☐

Undo Not Applicable

U.S. Department of Transportation
National Highway Traffic Safety Administration

DRIVER FORM

Special Crash Investigations
Non-Traffic Surveillance

1. Case Number

C R 1 7 0 1 3

DRIVER PROFILE

2. Driver's Age
99 = Unknown ___ ___

3. Driver's Sex
☐ Male
☐ Female
☐ Unknown

4. Driver's Height
999 = Unknown ___ ___ ___ cm

5. Driver's Weight
999 = Unknown ___ ___ ___ kg

6. Driver eyewear worn
(Select all that apply)
☐ None
☐ Eyeglasses
☐ Sunglasses
☐ Contacts
☐ Unknown

7. Driver vision deficiency condition
(Select all that apply)
☐ None
☐ Near sighted
☐ Far sighted
☐ Astigmatism
☐ Other (specify) _____
☐ Unknown

8. Non motorist's relationship to driver
☐ No relationship
☐ Child
☐ Grandchild
☐ Sibling
☐ Neighbor
☐ Friend
☐ Other (specify): _____
☐ Unknown

DRIVER ACTIONS

9. Driver approach to vehicle for entry
☐ From left front
☐ From left
☐ From left rear
☐ From right rear
☐ From right front
☐ Circled vehicle
☐ Return trip (backing into driveway/lot)
☐ Other (specify): _____
☐ N/A
☐ Unknown

10. Driver entry interruption
(Select all that apply)
☐ Direct trip from building to vehicle
☐ Loaded items into vehicle
☐ Spoke with family
☐ Spoke with neighbors
☐ Spoke with contacted nonmotorist
☐ Return trip (backing into driveway/lot)
☐ Other (specify): _____
☐ N/A
☐ Unknown

11. Purpose of backing
☐ Leaving parking space in parking lot
☐ Backing onto roadway from driveway
☐ Entering parking space in parking lot
☐ Backing into driveway from roadway
☐ Other (specify): _____
☐ N/A
☐ Unknown

12. Where was driver going
Description:

_____

_____

13. Driver in a hurry
☐ Yes ☐ No ☐ N/A ☐ Unknown

14. How did driver check behind (rear area of vehicle) after vehicle entry
(Select all that apply)
☐ Did not look
☐ Checked mirrors
☐ Turned right and looked back
☐ Turned left and looked back
☐ Viewed Camera
☐ Listened for auditory/visual warning from system
☐ Other (specify): _____
☐ N/A ☐ Unknown

15. Estimated time between vehicle entry and start of backing
☐ 0-10 Seconds
☐ 11-30 Seconds
☐ 31-60 Seconds
☐ Over 60 Seconds
☐ N/A
☐ Unknown

Not Applicable

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Special Crash Investigations – Non-Traffic Surveillance: Driver Form **Page 2**

16. What direction was the driver looking during backing maneuver
(Select all that apply)

- ☐ Straight ahead
- ☐ Right
- ☐ Left
- ☐ Rearward
- ☐ At object inside the car
- ☐ At mirrors
- ☐ Other (specify): _____
- ☐ N/A
- ☐ Unknown

17. Was the driver distracted during back up maneuver
(Select all that apply)

- ☐ No non-driving activities

External

- ☐ Looking at other vehicles
- ☐ Looking at other non motorist
- ☐ Looking at intended turn destination
- ☐ External focus, not specified
- ☐ Other external focus (specify): _____

Internal

- ☐ Looking at other occupant
- ☐ Talking to passenger
- ☐ Dialing phone
- ☐ Talking on phone
- ☐ Listening to radio/CD/portable playback device
- ☐ Adjusting radio/CD player
- ☐ Adjusting climate controls
- ☐ Using a device/controls integral to vehicle (specify): _____
- ☐ Reading/adjusting navigation system
- ☐ Eating or drinking
- ☐ Smoking related
- ☐ Retrieving fallen object (specify): _____
- ☐ Internal focus, not specified
- ☐ Focused on other internal object (specify): _____
- ☐ N/A
- ☐ Unknown

18. Driver avoidance actions prior to impact
(Select all that apply)

- ☐ None
- ☐ Braking
- ☐ Steering left
- ☐ Steering right
- ☐ Accelerating
- ☐ Other (specify): _____
- ☐ N/A
- ☐ Unknown

19. Did driver see struck non motorist prior to impact
(Select all that apply)

- ☐ No, never saw non motorist
- ☐ Saw non motorist prior to entering vehicle
- ☐ Saw non motorist after entering vehicle
- ☐ Other (specify): _____
- ☐ N/A ☐ Unknown

20. Est time between start of backing and impact

- ☐ <2 or = 1 second
- ☐ 2-5 seconds
- ☐ 6-10 seconds
- ☐ > 10 seconds
- ☐ N/A ☐ Unknown

21. Driver interior sightline obstructions
(Select all that apply)

- ☐ Pillar
- ☐ Headrest
- ☐ Cargo
- ☐ Other occupant
- ☐ Other (specify) _____
- ☐ Unknown
- ☐ None

22. Recent experience driving this vehicle

- ☐ More than 10 times the last three months
- ☐ 6-10 times the last three months
- ☐ 2-5 times the last three months
- ☐ Less than 2 times the last three months
- ☐ First time driving this vehicle
- ☐ N/A
- ☐ Unknown

23. Frequency of driving in this parking lot/driveway

- ☐ Daily
- ☐ Weekly
- ☐ Several times a month
- ☐ Monthly
- ☐ Rarely
- ☐ First time in lot/driveway
- ☐ N/A ☐ Unknown

24. Driver Impairment
(Select all that apply)

- ☐ No drugs or alcohol present
- ☐ Alcohol present (specify BAC): _____
- ☐ Drugs present (specify): _____
- ☐ Unknown

25. Source of alcohol/drug results

- ☐ Police reported
- ☐ Medical record
- ☐ Other (specify) _____
- ☐ Not Tested
- ☐ Unknown if tested

Revised January 2018

Not Applicable ☐

U.S. Department of Transportation
National Highway Traffic Safety Administration

Non Motorist Form

Special Crash Investigations
Non-Traffic Surveillance

1. Case Number: C R 1 7 0 1 3

NON-MOTORIST PROFILE

2. Non-motorist's Age (99 = Unknown): 0 2 ☐ Months ☒ Years

3. Non-motorist's Sex
- ☒ Male
- ☐ Female
- ☐ Unknown

4. Non-motorist's Height (999 = Unknown): 0 9 1 cm

5. Non-motorist's Weight (999 = Unknown): 0 1 2 kg

6. Medical outcome
- ☐ Not injured
- ☐ ER only
- ☐ Hospitalized 1-4 days
- ☐ Hospitalized 5 days or more
- ☐ Treatment later
- ☒ Fatal
- ☐ Unknown

7. Source of most severe injury
- ☐ Bumper
- ☒ Tire
- ☐ Undercarriage
- ☐ Other Specify: _____
- ☐ Ground
- ☐ N/A
- ☐ Unknown

8. Non-motorist impairment (*Select all that apply*)
- ☒ No drugs or alcohol present
- ☐ Positive for alcohol (specify BAC): _____
- ☐ Positive for drugs (specify): _____
- ☐ Unknown

9. Source of alcohol/drug results
- ☐ Police reported
- ☐ Medical Report
- ☐ Other (specify) _____
- ☒ Not Tested
- ☐ Unknown if tested

NON-MOTORIST ACTIONS

10. Non-motorist attitude
- ☐ Standing
- ☐ Bending at waist
- ☐ Sitting
- ☐ Crouching
- ☐ Kneeling
- ☐ On skates/skateboard
- ☐ On bike/scooter
- ☒ Other (specify) Fell out
- ☐ Unknown

11. Non-motorist motion
- ☒ Not moving
- ☐ Walking slowly
- ☐ Walking rapidly
- ☐ Running or jogging
- ☐ Skipping/Hopping/Jumping
- ☐ Falling/Stumbling/Rising
- ☐ On skates/skateboard
- ☐ On bike/scooter
- ☐ Other (specify): _____
- ☐ Unknown

12. Non-motorist approach relative to rear of vehicle
- ☐ Stationary
- ☐ From left
- ☐ From right
- ☐ From behind
- ☒ Other (specify): Fell out left front door
- ☐ Unknown

13. Non-motorist first avoidance action
- ☒ No avoidance actions
- ☐ Stopped
- ☐ Accelerated pace
- ☐ Ran away (along vehicle path)
- ☐ Jumped
- ☐ Turned away from vehicle
- ☐ Turned toward vehicle and braced
- ☐ Dove or fell away from vehicle
- ☐ Other (specify): _____
- ☐ Unknown

14. Non-motorist primary focus of attention
- ☒ Striking vehicle
- ☐ Play object
- ☐ Person
- ☐ Surrounding traffic
- ☐ Animal
- ☐ Handheld electronic (phone, MP3 player, etc.)
- ☐ Other Object (specify) _____
- ☐ Unknown

15. Were any other Non-motorists present? (*Select all that apply*)
- ☐ Alone
- ☒ One adult present
- ☐ One other child present
- ☐ Multiple adults present
- ☐ Multiple children present
- ☐ Unknown

Revised January 2018

NON MOTORIST CLOTHING

NOTES:

- Specify Color, Fabric and Texture/Weight for outermost layer only
- Indicate "*NONE*" if applicable
- Available codes:

Colors		***Fabrics***	***Textures***	***Weights***
Black	Charcoal gray	Natural	Soft	Heavy
Lt gray/silver	Brown	Synthetic	Slick	Medium
Gold/tan	Purple	Blend	Coarse	Light
Dark blue	Light blue			
Dark green	Light green			
Maroon	Red			
Orange	Yellow			
White	Other (specify)			
Pink				

	Clothing	Color	Fabric	Texture	Weight
HEADWEAR	Hat	Unknown	Unknown	Unknown	Unknown
	Helmet				
	Hood				
	Other (specify): _____				
	Unknown				
UPPER BODY	Short Sleeve	Unknown	Unknown	Unknown	Unknown
	Long Sleeve				
	Light Jacket				
	Heavy Jacket				
	Other (Specify): _____				
	Unknown				
LOWER BODY	Shorts	Unknown	Unknown	Unknown	Unknown
	Pants				
	Shoes				
	Other (specify): _____				
	Unknown				

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**National Highway
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