SAFETY IN SIGHT:

A Factsheet on Rear-End Collisions for Truck Drivers and Employers

Texas A&M Transportation Institute | Center for Transportation Safety

The Problem:

Large Truck Crashes in Texas

Texas has a high number of fatal truck crashes.[1]

Rural roads are more dangerous than urban roads because they have higher speed limits, less traffic, and different safety features.

Overall, in Texas, **crashes on rural roads are nearly 4 times more likely to be fatal** compared to urban roads.[2]

Over half of Texas truck miles are traveled on rural roadways based on 2019 and 2020 estimates.

About **1 in 5 two-vehicle crashes** involving a large truck are rear-end crashes.[3]

Rear-end collisions involving large trucks can be especially **dangerous because of the size and weight** of large trucks.

Project Overview:

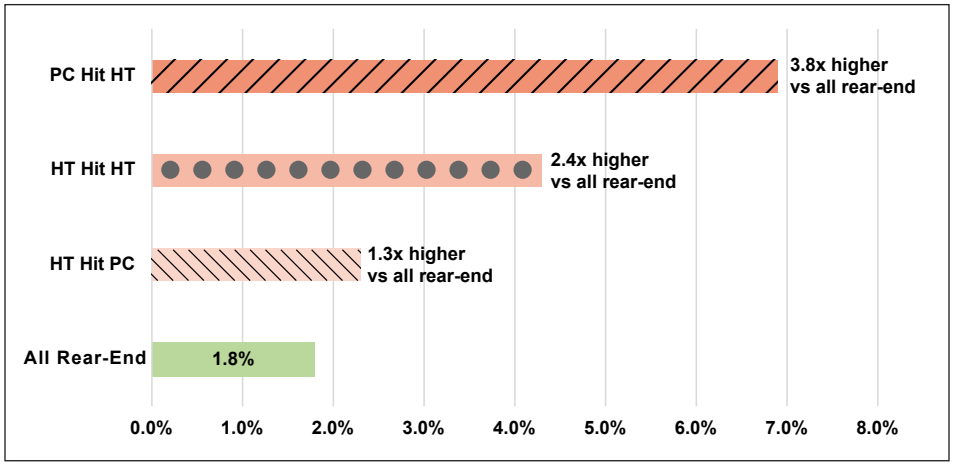
To address the issue of rear-end collisions involving heavy trucks (HT)[4] in Texas, this project conducted a detailed analysis of two-vehicle rear-end crashes involving a HT. The project then produced and disseminated outreach and educational materials to improve knowledge of rear-end crashes and their prevention among employers, truck drivers, and law enforcement officers. The materials also included recommendations for increasing the visibility of trucks.

Freeways account for almost half of all two vehicle rear-end crashes involving a heavy truck, although the most severe crashes happen on two lane and multi-lane undivided roads.

Project Data:

This project compared rear-end crashes involving heavy trucks (HTs) in Texas, considering the vehicle at fault[5,6], driver behavioral factors, and geographic area. The study found that rear-end crashes involving HTs are more severe than rear-end crashes overall. In particular, 4.8% of rear-end crashes involving HTs resulted in a fatal or suspected serious injury (classified as a severe crash), compared to 1.8% of rear-end crashes overall. The severity of rear-end crashes also varies by vehicle at fault. When a passenger car (PC) hits an HT, 6.9% of crashes result in a death or serious injury, compared to 2.3% when an HT hits a PC.

Vehicle at Fault & Percentage of Severe Crashes



PC: Passenger Car; HT: Heavy Truck

1 FMCSA. 2019 CMV Traffic Safety Fact Sheet. Available at: https://w2958ww.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/safety/data-and-statistics/473411/cmvtrafficsafetyfactsheet2018.pdf

2 TxDOT. (2022). Rural and Urban Crashes and Injuries by Severity. Available at: https://ftp.txdot.gov/pub/txdot-info/trf/crash_statistics/2022/11.pdf

3 Based on all 2017–2021 TxDOT reportable two-vehicle crashes involving a truck tractor or truck, and excluding pedestrian or pedalcyclist involved crashes.

4 Defined as a truck tractor or truck with a gross vehicle weight of 10,001 pounds or more.

5 Defined as a vehicle that rear-ends the other vehicle.

6 About 8% of crashes also involve a heavy truck that rear-ends another heavy truck.

The study found that rear-end crashes in rural and fringe[7] areas are more severe than rear-end crashes in urban areas. For example, when a PC hits an HT, 12.6% of crashes result in death or serious injury in rural areas, compared to 4.8% in urban areas. Similarly, when an HT hits a PC, 6.9% of crashes result in death or serious injury in rural areas, compared to 1.4% in urban areas.

Vehicle At Fault & Geographic Area in Severe Crashes

DRIVER AT-FAULT * / DRIVER BEHAVIORAL FACTOR	PASSENGER CAR DRIVER	HEAVY TRUCK DRIVER
% DISTRACTION that are severe in rural vs fringe vs urban	17% vs 10% vs 5%	9% vs 3% vs 2%
% FATIGUE that are severe in rural vs fringe vs urban	12% vs 10% vs 7%	16% vs 23% vs 10%
% IMPAIRMENT that are severe in rural vs fringe vs urban	26% vs 29% vs 18%	33% vs 50% vs 17%
% IMPROPER LANE CHANGE that are severe in rural vs fringe vs urban	6% vs 5% vs 5%	0% vs 0% vs 1%
% IMPROPER TURN that are severe in rural vs fringe vs urban	9% vs 0% vs 0%	0% vs 0% vs 1%
% SPEEDING that are severe in rural vs fringe vs urban	14% vs 12% vs 7%	7% vs 3% vs 1%

Approximately 11% of rear-end crashes involve a work zone. The proportion of work zone crashes that are severe varies by vehicle at-fault: 7% when a passenger car hits a heavy truck and 2% when a heavy truck hits a passenger car.

**Excludes crashes involving two heavy trucks*

The project's findings suggest that there are several factors that contribute to the severity of rear-end crashes involving an HT, depending on the vehicle at fault.

When an HT hits a PC, significant factors that contribute to increased crash severity include alcohol/drug impaired driving and fatigue.

Significant Variables that Contribute to Increased Crash Severity

Heavy Truck At-Fault*

HEAVY TRUCK DRIVER VARIABLES	PROBABILITY OF A SEVERE CRASH OUTCOME	COMPARATIVE RISK
Alcohol/Drug Impaired	29.4%	15.5x higher vs. non-impaired HT driver
Fatigued	4.3%	2.3x higher vs. non-fatigued HT driver
PASSENGER CAR DRIVER VARIABLES	**PROBABILITY OF A SEVERE CRASH OUTCOME**	**COMPARATIVE RISK**
Alcohol/Drug Impaired	10.6%	5.6x higher vs. non-impaired PC driver
ENVIRONMENT AND ROADWAY FACTORS	**PROBABILITY OF A SEVERE CRASH OUTCOME**	**COMPARATIVE RISK**
Rural Area	2.2%	1.8x higher vs. non-rural areas
Nighttime	3.4%	2x higher vs. daytime

**Excludes crashes involving two heavy trucks*

When a PC hits an HT, significant factors that contribute to increased crash severity include alcohol/drug impaired driving and speeding.

[7] Fringes are buffer areas between rural and urban areas.

Significant Variables that Contribute to Increased Crash Severity

Passenger Car Driver At-Fault*

PASSENGER CAR DRIVER VARIABLES	PROBABILITY OF A SEVERE CRASH OUTCOME	COMPARATIVE RISK
Alcohol/Drug Impaired	10.3%	2.4x higher vs. non-impaired PC driver
Speeding	6.2%	2.3x higher vs. non-speeding PC driver
HEAVY TRUCK DRIVER VARIABLES	**PROBABILITY OF A SEVERE CRASH OUTCOME**	**COMPARATIVE RISK**
Improper Turn	6.9%	2.9x higher vs. non-improper turn by HT driver
ENVIRONMENT AND ROADWAY FACTORS	**PROBABILITY OF A SEVERE CRASH OUTCOME**	**COMPARATIVE RISK**
Rural Area	5.6%	1.4x higher vs. non-rural areas
Nighttime	5.7%	1.4x higher vs. daytime
Non-Intersection Related	4.7%	1.1x higher vs. intersection related
Multi-Lane Undivided Roadway	7.6%	1.8x higher vs. all other roadways
Two-Lane Roadway	5.5%	1.3x higher vs. all other roadways

**Excludes crashes involving two heavy trucks*

Rural area and nighttime crashes can be more severe, regardless of vehicle at fault.

A Summary:

Significant driver contributing factors leading to increased crash severity include:

- **Alcohol/drug impairment:** Driving under the influence of alcohol/drugs is associated with a higher probability of a severe crash. While the frequency of truck drivers under the influence of alcohol/drugs is under one percent, the probability of a severe crash when the heavy truck is at fault is the greatest among all driver contributing factors. A passenger car driver under the influence of alcohol/drugs is also found to be significant factor for a severe crash regardless of the vehicle at-fault.
- **Fatigue:** While the frequency of truck drivers driving when fatigued is under one percent, it is a significant factor associated with a higher probability of a severe crash when the truck driver is at fault.
- **Speeding:** Speeding is a factor in half of all HT involved rear-end crashes regardless of vehicle at fault.
- **Making improper turns:** A heavy truck making an improper turn is a significant factor in crashes where a passenger car rear-ends the heavy truck. This includes turning too wide and turning from the wrong lane.

Alcohol impairs judgment, coordination, and reaction time, all of which are essential for safe driving. Even small amounts of alcohol can impair your ability to drive safely.

Improper turn includes turning too wide and turning from the wrong lane. When you make a turn, it is important to be aware of your surroundings and to signal your intentions early.

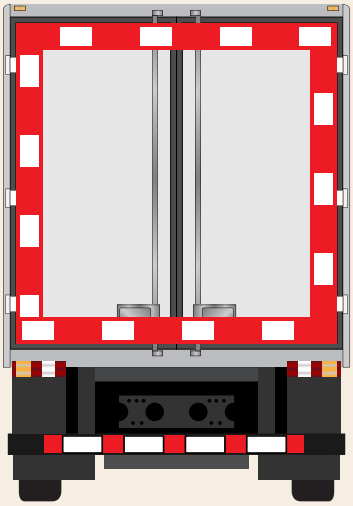
When you speed, you have less time to react to hazards and you are more likely to lose control of your vehicle. Even a small increase in speed can make a big difference in the severity of a crash.

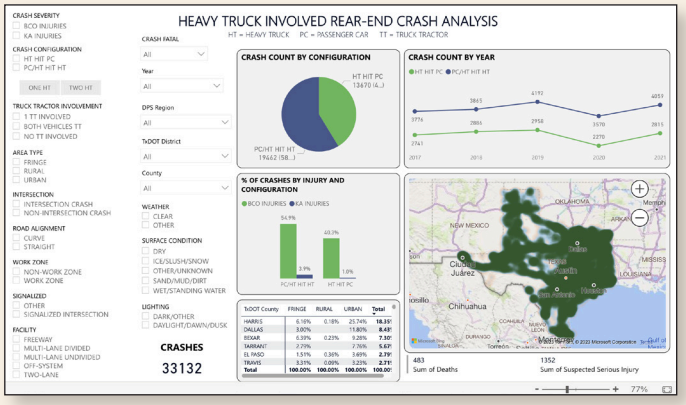
Fatigue can slow your reaction time, impair your judgment, and make you more likely to make mistakes. If you are feeling tired, it is important to pull over and take a nap or get some other form of rest.

A Solution:

There are several resources are available for truck drivers and employers.

- Crash Data Dashboard
- Fatal Crash Diagrams
- Map Tools to Identify High-Risk Roads for Truck Crashes
  - Web-based version (users can filter roadways by amount of truck travel and risk level)
  - Google Earth Map version
- Animation with Guidelines for Installing Reflectorized Conspicuity Tape
  - At minimum, CMVs should meet FMCSA Conspicuity Requirements
  - To further increase visibility, place 4 inch red and white reflectorized conspicuity tape on the back of a heavy truck or trailer, in the following configuration:
    - » Outline the back of the heavy truck or trailer completely
    - » Run the tape the length of the underride guard





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Website

https://cts.tti.tamu.edu/heavy-truck-involved-rear-end-crash-analysis-dashboard/