# A tragic design flaw: Higher standards for semi-truck underride guards needed to save lives, reduce manufacturers' liability

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All trucking accidents are typically devastating to car occupants because of the tremendous size and speed of the semitrucks, but underride crashes are particularly lethal. Underride crashes occur when a car collides into the rear or side of a semi-truck trailer. More than 400 drivers and passengers are killed each year due to underride crashes,<sup>1</sup> and about 5,000 additional people are injured.<sup>2</sup>

As a car collides with the semi-truck's trailer, the trailer can act like a guillotine as the car submarines underneath the trailer. The force of the impact, combined with the weight of the trailer, can crush or shear off the car's roof.

Occupants often suffer severe or fatal head and upper torso injuries, and sometimes decapitation.

Since the 1950s federal law has required semi-truck trailers to be fitted with metal structures called "underride guards" on the rear to prevent such crashes.

Studies analyzing both real-world collisions and crash tests indicate, however, that federal minimum requirements for underride guards are not sufficient to protect motorists. Underride guards that comply with the minimum federal standards often fail even at low speeds.

Product liability lawsuits against semi-truck trailer manufacturers are common when the failure leads to an injury or death.

Safety organizations have pushed for more stringent underride regulations since the 1960s, but their efforts have repeatedly been met with resistance from the trucking industry. The few reforms that have been made over the past 50 years apply to less than half of heavy trucks on our roads and do not adequately safeguard motorists from devastating underride crashes.

The federal government must impose higher standards to strengthen and improve underride guards. Regulations should also be extended to cover all heavy trucks that pose a danger of underride. In our own practice, we have seen a number of underride fatalities that may have been prevented if higher standards were in place. These reforms have the potential to save hundreds of lives per year and reduce the liability of semi-truck and trailer manufacturers.







In the event of a side or rear-end collision with a tractor-trailer, cars can submarine under the truck, crushing the roof or shearing it completely off and often causing severe or fatal upper torso or head injuries.

## UNDERRIDE GUARD REGULATIONS

In 1953 the federal government enacted regulations that required interstate semitrucks to have rear underride guards, but the rules had no specifications for strength, energy absorption or attachment methods.<sup>3</sup>

In the 1960s and 1970s, numerous studies and organizations called for higher underride guard standards to ensure the guards were strong enough to protect motorists from going under heavy trucks.<sup>4</sup>

The trucking industry opposed higher standards.

The industry argued that the added weight of strong underride devices would allow for less cargo and increase expenses,<sup>5</sup> and it denied that it was the industry's responsibility to protect motorists.

In comments to proposed rule changes by the National Highway Traffic Safety Administration, the American Trucking Association said, "It is fundamentally unfair to place all the onus on the innocent party — the truck — to protect the driver of the impacting vehicle."<sup>6</sup>

The American Petroleum Institute added, "After all, the automobile driver is the miscreant — he hits the rear of the truck, not vice versa."<sup>7</sup>

The Insurance Institute for Highway Safety, an independent, nonprofit organization that has been pushing for higher underride guard standards for decades, said this view equated to an argument that roadside guardrails should not be used "because some drivers whose cars are protected by the guardrails may be 'miscreants' responsible for leaving the road."<sup>8</sup>

The trucking industry's comments also ignore situations where cars are faultlessly jettisoned into the rear of semi-trucks, such as multi-vehicle highway pileups.

In 1998, after decades of lobbying from safety organizations like the IIHS, NHTSA instituted additional underride guard regulations through Federal Motor Vehicle Safety Standards 223 and 224.

FMVSS 224 specifies the types of trailers that must have underride guards as well as the dimensions of the guards. FMVSS 223 imposed strength requirements for three different parts of the guards.

But experts say these minimum standards do not go far enough to protect motorists.

FMVSS 223 in particular has been criticized because it does not require strength testing for the underride guard system as a whole. As a result, poor welds and weak bolts can compromise the integrity of an underride guard whose individual parts pass the required strength test. In addition, the majority of heavy trucks on the road are not subject to underride rules.<sup>9</sup>

These include trailers with rear wheels set close to the back, as well as single-unit trucks with a cab and cargo body on one chassis (*e.g.* dump trucks).<sup>10</sup> Because these heavy trucks are also frequently involved in devastating underride crashes, safety proponents urge for broader applicability of underride guard regulations.

## STUDIES FIND IMPROVEMENTS TO UNDERRIDE GUARDS WOULD SAVE LIVES

While car safety features have vastly improved since the 1990s, standards for semi-truck underride guards have not changed, and guards often fail at low speeds. The IIHS recently examined how, why and at what speed these guards fail.

"The aim was to see if some underride guards perform better than others, and to identify what crash speeds and configurations produce different types of failure," said Adrian Lund, president of the IIHS.<sup>11</sup> The IIHS examined real-world underride crashes and conducted its own crash tests. Of about 1,000 real-world crashes examined by the IIHS, 115 involved a vehicle that collided into the rear of a heavy truck or semi-trailer.<sup>12</sup>

Seventy-eight percent of the vehicles submarined under the truck or semi-trailer.<sup>13</sup> Half of the underride crashes resulted in severe or catastrophic damage.<sup>14</sup> Twenty-three car occupants were killed.<sup>15</sup>

The IIHS followed up this study with a series of crash tests that evaluated three different underride guards. All three complied with U.S. federal requirements, and two also complied with more stringent Canadian standards. The study used the 2010 Chevrolet Malibu, which earned a five-star safety rating and was a "Top Safety Pick" by the IIHS.<sup>16</sup>

The crash tests offered some guidance for making the underride guards safer. The strongest of the three guards, a guard manufactured by Wabash National Corp. that met the tougher Canadian standards, prevented underride in a center-rear test at 35 mph. Lund commented, "It's clear to our engineers that Wabash understands how underride guards and trailers work together as a unit instead of treating them as separate components."<sup>21</sup>

There is still room for improvement for the Wabash guard, however.

"The best underride guard was a big improvement over the weakest one, but it still failed when hit near the outermost end of the guard," Lund said. "Failures like this were among the most common in our analysis of real-world crashes. Canada's

# Safety organizations have pushed for more stringent regulations since the 1960s, but the trucking industry has resisted.

Despite the Malibu's above-average safety ratings, the crash tests revealed its occupants faced catastrophic consequences in underride crashes.

Lund put it this way: "Cars' front-end structures are designed to manage a tremendous amount of crash energy in a way that minimizes injuries for their occupants. Hitting the back of a large truck is a gamechanger. You might be riding in a vehicle that earns top marks in frontal crash tests, but if the truck's underride guard fails or isn't there at all, your chances of walking away from even a relatively low-speed crash aren't good."<sup>17</sup>

The report showed that truck under-ride bars can fail in relatively low-speed crashes leading to deadly consequences for car occupants.<sup>18</sup> "A guard can still fail in a crash test with a speed as low as 30 or 35 miles an hour," Matthew Brumbelow, senior research engineer for the IIHS, told ABC News.<sup>19</sup>

In three of the six crash tests, dummies' heads were contacted, recreating the danger of decapitation that is seen in real-world crashes. "Damage to the cars in some of these tests was so devastating that it's hard to watch the footage without wincing. If these had been real-world crashes, there would be no survivors," Lund said.<sup>20</sup>

underride standard is tougher than U.S. requirements but still not strong enough or comprehensive enough to prevent underride in crash configurations that cause many severe injuries.

"Under current certification standards," Lund continued, "the trailer, underride guard, bolts and welding don't have to be tested as a whole system. That's a big part of the problem. Some manufacturers do test guards on the trailer. We think all guards should be evaluated this way. At the least, all rear guards should be as strong as the best one we tested."<sup>22</sup>

## PUSH FOR HIGHER STANDARDS

Based on these findings, the IIHS has petitioned NHTSA in 2011 to make several improvements to underride guard standards.<sup>23</sup>

First, it called for stronger rear underride guards on large trucks.

Second, it recommended that standards should require testing close to the ends of the guard to ensure protection in offset crashes.

Third, the IIHS asked to reform the strength testing under FMVSS 223 to require that the underride guard system stay fully intact to fulfill the strength requirements, rather than merely testing the individual parts. This would provide a more reliable test of how the guard would function in the real world and, in theory, would produce guards that work as a unit, like the Wabash guard used in the recent IIHS crash tests. The IIHS recommended that attachment hardware be made stronger than the guard so it would remain in place when the structure starts to deform in a crash.

Fourth, the IIHS asked the NHTSA to extend underride guard requirements to cover exempt trucks, which it estimated were half of heavy trucks on the road.

## TRUCKING INDUSTRY RESISTS HIGHER STANDARDS, NHTSA SITS ON ITS HEELS

In response to the IIHS' study and recommendations, the Tractor Trailer Manufacturers Association voiced the same concerns it did in the 1970s: that the added weight of stronger underride bars would displace cargo.

"[A]dding structural components to trailers to support full-width, rigid guards will add weight to the trailers and necessarily require the displacement of some cargo onto other trucks and trailers," the TTMA said in a statement.<sup>24</sup>

The TTMA also claimed that the potential for more fatalities goes up with rigid guards that prevent underride because of the sudden forces of deceleration that occupants experience. This logic has been used for decades by opponents of higher underride guard standards, but the IIHS has dismissed this concern as outdated because cars today have dramatically improved frontal crashworthiness compared to past models.

Based on its recent study of real-world underride crashes and underride crash tests, the IIHS stated that its "latest analysis indicates that guards too weak to adequately mitigate underride are a bigger problem than overly stiff guards."<sup>25</sup> NHTSA put out a statement saying it was "well aware of the severity of the truck underride issue and first identified the need to strengthen underride performance in rear corner impact crashes in 2009."

While car safety features have vastly improved since the 1990s, standards for semi-truck underride guards have not changed, and guards often fail at low speeds.

Since then, the agency said, "We have been conducting an in-depth field analysis to determine how we can improve that standard to save lives."<sup>26</sup>

Essentially, NHTSA has sat on its heels for three years despite its knowledge that underride guards must be improved and despite studies that confirm improvements will save lives.

About 10 people per week are killed as the public waits for much needed reforms. NHTSA cannot rely on manufacturers to make these improvements on their own; it must intervene to ensure that underride guards are made stronger in order to prevent countless needless deaths.

### NOTES

<sup>1</sup> Press Release, Insurance Institute for Highway Safety, Underride Guards on Big Rigs Often Fail In Crashes, Institute Petitions Government for New Standard (Mar. 1, 2011), *available at* www.iihs.org/ news/2011/iihs\_news\_030111.pdf.

<sup>3</sup> Status Report, Illinois Institute for Highway Safety, Vol. 46, No. 2, Mar. 1, 2011.

<sup>4</sup> See, e.g., Senate Committee on Commerce, Science & Transportation, Consumer Subcommittee, Truck-Car Crash Safety (Mar. 16, 1977); Daniel J. Minahan & James O'Day, Fatal Car-Into Truck/Trailer Underride Collisions. HSRI Research Rev., Univ. of Mich. Highway Safety Research Inst., Vol. 8, No. 3, December 1977.

See Minahan & O'Day, supra note 4.

<sup>6</sup> *Id.*, citing Further Comments of American Trucking Associations, Oct. 21, 1970, NHSB Docket Nos. 1-11; notices 5 & 6.

<sup>7</sup> *Id.*, citing Comments of American Petroleum Institute, Oct. 21, 1970, NHSB Docket Nos. 1-11; notices 5 & 6.

See Truck-Car Crash Safety, supra note 4.

<sup>9</sup> See Status Report, *supra* note 3, at 4.

<sup>10</sup> *Id*.

<sup>11</sup> *Id*. at 5.

<sup>12</sup> *Id*. at 2.

<sup>13</sup> *Id.* at 4.

<sup>14</sup> Id.

<sup>15</sup> Id.

<sup>16</sup> *Id*. at 5.

<sup>17</sup> *Id.* at 2.

<sup>18</sup> Id.

<sup>19</sup> Brendan McLaughlin, *I-Team: Feds Take Their Time Addressing Safety Concerns About the Rear of Tractor Trailers*, ABC Action News, May 5, 2012, *available at* http://www.abcactionnews.com/dpp/news/local\_news/investigations/i-team-feds-take-their-time-to-address-safety-concerns-about-the-backs-of-tractor-trailers.

<sup>20</sup> See Status Report, *supra* note 3, at 6.

<sup>21</sup> Id.

<sup>22</sup> *Id.* at 7.

Petition to NHTSA, Petition for Rulemaking; 49 C.F.R. Part 571 Federal Motor Vehicle Safety Standards; Rear Impact Guards; Rear Impact Protection. Ins. Inst. for Highway Safety, Feb. 8, 2012, available at http://www.iihs.org/news/rss/ pr030111.html.

<sup>24</sup> *Id.* at 19.

<sup>25</sup> See Status Report, *supra* note, 3, at 3.

<sup>26</sup> *Id.* at 19.

<sup>&</sup>lt;sup>2</sup> Id.