

1. Are Your Trucks Overloaded?

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For the last several months, I have discussed various aspects of truck specifications and how the specifications can impact your fleet's operations. This month, I am addressing the issue of truck overloading. At first glance, overloading seems to be a rather straight-forward issue, but, in actuality, a truck can be overloaded in many different ways. Considerable research and careful design is required to make sure your trucks are properly designed for all of the various loading situations encountered during day-to-day operations.

The Impact of Overloading

As a fleet manager, you should be very concerned with how your trucks are loaded and if they are overloaded. First and foremost, an overloaded truck is in violation of numerous state and federal regulations and is unsafe to operate. In addition, an overloaded truck is costly to maintain and operate. Remember when you design a truck for a given application, it can be overloaded in more than one way. In fact, a truck can be fully loaded without being overweight and yet be overweight with a partial load.

As you may know, a truck has a maximum design weight, referred to as the Gross Vehicle Weight Rating (GVWR). This rating can never be *more* than the combined ratings of all of the truck's axles, but, in most cases, it is usually *less*. A number of factors, including allowances for various load placements, frame rating, powertrain rating, suspension component ratings, and the foundation brake rating, can impact the GVWR of a truck.

What Else Limits a Truck's Weight Rating?

Beyond a truck's GVWR, a myriad of other factors can limit the weight capacity of a truck, including:

- GCWR
- GAWR
- Maximum trailing weight (trailer) rating
- Highway weight ratings
- Truck registration

Let's take a look at each of these factors.

GCWR (Gross Combination Weight Rating) – The GCWR is the maximum allowable weight for a truck and trailer combination including the tare weight of the truck; any cargo being carried on the truck; the weight of the trailer, the driver, passengers, and fuel (basically everything that moves with the vehicle).

GAWR (Gross Axle Weight Rating) – The GAWR is the value specified by the vehicle manufacturer as the load-carrying capacity of a single axle system. Each axle on a truck (and trailer) has a maximum allowable weight capacity. As previously noted, the GVWR of a truck is usually less than the combined GAWRs of all of a truck's axles. The GAWR is limited by the weakest link in the axle system which also includes the suspension and the tires. For example, an axle with a design rating of 21,000 pounds may be rated lower due to the rating of the selected suspension (springs) or tires. When calculating the design load on an axle, make sure to take into account any weight transferred to the axle from a trailer (tongue weight) and the potential placement of cargo.

Maximum trailing weight (trailer) rating – Lighter trucks (classes 1 through 5) usually have a maximum allowable towing weight rating. This rating limits the weight of any trailer being towed regardless of the GCWR, GVWR, and individual GAWRs assigned to the truck. Simply put, if a trailer weighs more than the allowable trailer rating, the truck is considered to be overloaded no matter the other values.

Highway Weight Ratings and Truck Registration – All of the above conditions represent the physical overloading of a vehicle. A vehicle can be *legally* overloaded if the weight of the vehicle exceeds the maximum allowable loading limits for a highway as established by (a combination of) state and federal regulations or if the weight of a vehicle exceeds its registered weight limit. When registering a vehicle, don't forget that in most states the towing vehicle must be registered for the maximum GCWR at which you plan to operate.

Truck Design Considerations
When specifying or designing a new truck, you should be careful to avoid all overload conditions. Most of all, be sure to avoid a design overload condition whereby the vehicle is overloaded when performing its intended functions.

For example, if you place a water tank with a capacity of 4,000 gallons on a chassis with a usable payload of 30,000 pounds, you have a design overload condition. Since water weighs eight pounds per gallon, the truck's normal cargo (4,000 gallons of water) will weigh 32,000 pounds (without even taking the weight of the tank into consideration).

During the design process, be sure to perform a series of weight distribution calculations to evaluate the truck's loading for all reasonable loading scenarios. When performing these calculations, I normally recommend starting with identifying the allowable highway loading limits where you will be operating (GCWR and GVWR). Assuming that you have succeeded in not designing a truck that will automatically be overloaded, the next step is to calculate individual axle loads. Subject to legal loading limits, these calculations will tell you what size axles (including suspension and tires) you need to incorporate into your truck design.

When calculating axle loadings, be sure to consider all reasonable scenarios. Remember the example I mentioned above where a truck could be acceptable when fully loaded, but overweight with a partial load. In many cases, a truck's front axle is more subject to overloading than the rear axle. A load placed behind the rear axle (trailer tongue loading or individual unit of cargo at rear of body) will actually take weight off of the front axle. It is entirely possible for a truck to leave the yard properly loaded and then become overloaded on the front axle when part of the cargo is unloaded. Be sure to take this into consideration if it is appropriate for your application.

Truck Weight Exemptions
I frequently hear from government fleet managers that they are "exempt from truck weight limits". This can indeed be true in the case of emergency vehicles, snow and ice control equipment, and similar public-need applications. However, be warned that you are not exempt from operating a safe vehicle as defined by the National Highway Traffic Safety Administration (NHTSA). While you may be exempt from highway loading limits, you are still subject to vehicle design loading restrictions. For example, if you plan on loading the rear axle of a piece of fire apparatus to 26,000 pounds, the axle (including springs and tires) must be rated for at least 26,000 pounds. Otherwise, you will be found operating an unsafe (overloaded) vehicle.

More Information
In the next issue of *Fleet Affiliation*, I will address the process of making vehicle weight distribution calculations and determining vehicle payloads.

If you would like more information on various aspects of the vocational vehicle design process, the NTEA's *Fleet Specifications and Design Training Program* or the many benefits of fleet membership with the NTEA, please contact me at bobj@ntea.com.