
Fire Lane/Truck PSI Information

When it comes to selecting a paving material—particularly those that will be used in driveways or for a fire lane—a top question is whether the paving material will be able to safely bear the weight of a fire truck.

This question requires special consideration, as a fire truck typically has a much higher axle weight than other vehicles. For this reason, some states (California included) allow fire trucks to exceed weight restrictions imposed on other vehicles by the Department of Transportation.

Summary

A GraniteCrete installation will have a fully supportive base, so it will not run the risk of collapsing beneath; therefore, the application of H-20 or HS-20 loading is not required.

GraniteCrete has an unconfined compressive strength of 837 psi, under ASTM D558. Simply put, GraniteCrete is an average of 3.5 - 4.5 times stronger in compression than what is required to withstand the surface pressure exerted by a heavy vehicle, such as a fire truck.

When a fire truck's stabilizer outriggers are in place, a point load as great as 45,000 pounds can be applied to the pavement surface. Although 45,000 pounds is significant, it will be distributed over a surface area of approximately 0.97 square feet (area of 10x14 inches), this equates to a surface pressure of 322 psi. Again, this is well within the compressive strength of GraniteCrete, as GraniteCrete is able to bear a vehicle weight of 75,000 pounds.

Explanation

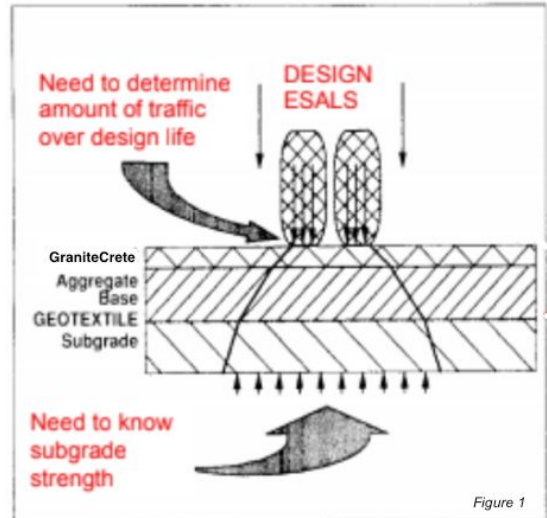
To determine whether a paving material will successfully bear the weight of a fire truck, there are three key criteria that should be evaluated:

- 1) The design equivalent single axle loads (ESALs) applied to the pavement system
- 2) The fire truck wheel and axle loads
- 3) Point loads that occur when the stabilizer outriggers are in place

Design ESALs

The 1993 *AASHTO Guide for Design of Pavement Structures* provides information about how thick a road cross-section has to be, for a paving material to be able to withstand the applied loads for the “given lifespan based on the native soils bearing capacity.” (see *Figure 1*)

ESALs help illustrate the equivalent damage that could be caused by each type of vehicle when compared to an 18,000-pound axle load.



For example, a standard passenger vehicle has a Vehicle Load Factor (VLF) of 0.0004 (in other words, 2,500 passenger vehicles would be required to create the same damage as one ESAL). In comparison, a full fire truck typically has a VLF from 0.21 to 6.87.

While the VLF of a fire truck seems frighteningly high compared to a standard passenger vehicle, it is important to remember that roadways are designed to withstand the millions of ESALs on the pavement surface at any given time, so the VLF of the occasional fire truck is actually rather low.

Wheel and Axle Loads

Most designers use H-20 or HS-20 from AASHTO (see *Figure 2*), or specific axle configurations (see *Figure 3*), to illustrate the load created by heavy vehicles, such as buses and fire trucks. These are also used to ensure that surfaces these heavy vehicles pass over—such as a bridge—will be able to support them.

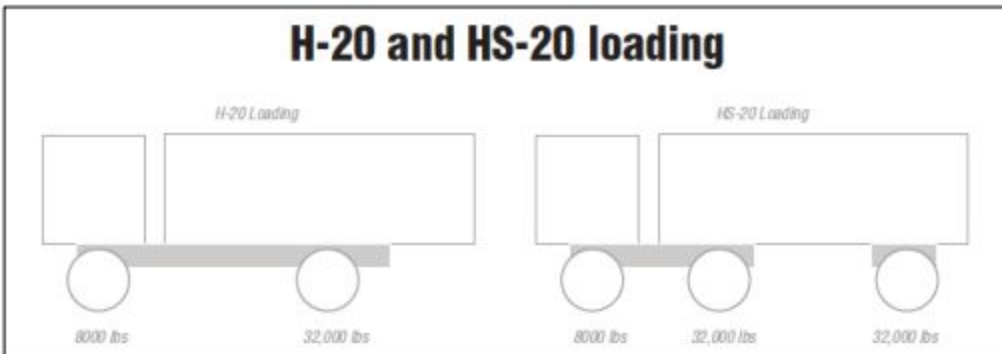


Figure 2

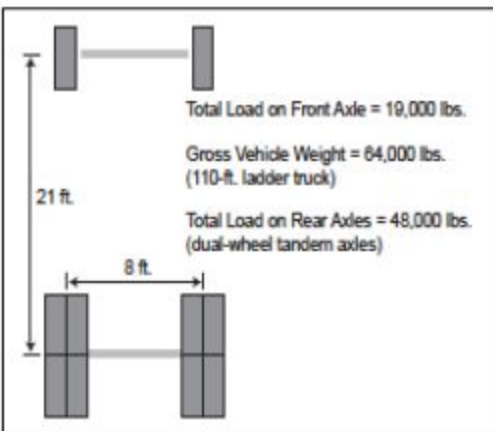


Figure 3

A GraniteCrete installation will have a fully supportive base, so it will not run the risk of collapsing beneath; therefore, the application of H-20 or HS-20 loading is not required.

Point Loads

In terms of being able to withstand the surface pressure exerted by truck tires, the California Department of Transportation website states that the maximum allowable gross axle weight (GAW) for a fire truck is 24,000 pounds on a single steering axle; it is 31,000 pounds on a single drive axle. The maximum allowable weight on each of the wheels is 12,000 pounds (24,000 pounds/2 wheels) for the former, and 15,500 pounds (31,000 pounds/2 wheels) for the latter. Using a conservative contact area on the bottom of the wheel of eight inches square, the pressure per square inch exerted by each wheel is 187.5 psi (12,000 pounds/64 square inches) or 242.2 psi (15,500 pounds/64 square inches).

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When a fire truck's stabilizer outriggers are in place, a point load as great as 45,000 pounds can be applied to the pavement surface. Although 45,000 pounds is significant, it will be distributed over a surface area of approximately 0.97 square feet (area of 10x14 inches), this equates to a surface pressure of 322 psi. Again, this is well within the compressive strength of GraniteCrete, as GraniteCrete is able to bear a vehicle weight of 75,000 pounds.

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