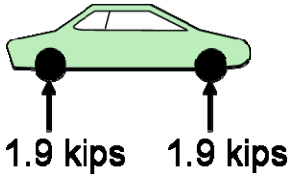
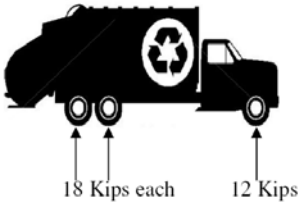
Load Damage from Trash Trucks

The damaging effect of the passage of an axle of any load can be represented by a number of 18,000-pound equivalent single axle load. The load damage factor increases as a function of the ratio of any given axle load raised to the fourth power (1). For example, one application of a 20,000 pound single axle load is slightly less than 8 times as damaging as a 12,000 pound single axle load $(20/12)^4$.

For our example, we will use a passenger car with a total weight of 3,800 pounds (2) or 1,900 (1.9 kips) per axle. The trash truck will be loaded to the maximum weight without needing a permit from CDOT of 48,000 pounds. Typically, the maximum load on the steering axle is 12,000 pounds (12 kips) and the remaining 36,000 pounds will be evenly distributed on the other two axles (18 kips per axle).





In this example, the damage from one combination truck is equal to 9646 cars.

Here is the math:

Front axle = $(12/1.9)^4$ = 1,591 cars
Rear axles = $(18/1.9)^4$ = 8055 cars

References

(1) AASHTO Guide for Design of Pavement Structures 1993 page I-11
(2) Statement of Clarence M. Ditlow Director of the Center for Auto Safety before the Senate Committee on Commerce, Science and Transportation in Washington DC on December 6, 2001.

Pavement Design
Cars versus Trash Trucks

In the structural pavement design process for CDOT, we convert all types of vehicles and various axle configurations to an 18,000 pound equivalent single axle load (18 k ESAL). These conversion values can be found in the appendix D of the AASHTO Guide for the Design of Pavement Structures.

For our example, we used the information for a terminal serviceability of 2.0

2 kip single axle = .0002
Therefore, 1 car = .0004 ESALs

12 kip single(driving) axle = 0.189
36 kip dual axle = 2.76
Therefore 1 trash truck = 2.949 ESALs

1 combination truck = (2.949 / .0004) cars
1 combination truck= 7,372 cars