

Strength of Grass Paving Structures

Many designers have questioned the strength of grass paving reinforcement structures to determine suitability for specific traffic and load bearing applications, and to compare products made by different manufacturers.

We at Invisible Structures, Inc. would like to assure you about product strength as a design issue, and clarify all of the data contained in various forms of product information.

All Grass Paving Structures are Strong Enough to Support the Heaviest Vehicles allowed on Highways!

This statement is made after analyzing all of the product specifications in this industry and translating the load bearing test data to a common factor.

We at ISI prefer to use pounds per square inch (psi, or kPa for metric), because it is easy to relate to on a personal level, and it relates directly to tire pressure ratings - the amount of pressure applied to a surface by the tire contact area.

How Much Strength is Needed?

Heavy truck tire pressures for vehicles used on public highways is usually a maximum of 120 psi (827 kPa). These vehicles generally carry loads that average less than 5000 lbs (2268 kg) per tire, which means a contact area usually less than 6.5" x 6.5" (16.5 cm x 16.5 cm). Outriggers, found on fire trucks, are also designed to not exceed this pressure.

Extremely High Compressive Strength

Grasspave² is extremely strong. Independent lab compression tests show Grasspave² with a load bearing capacity of **15,940 psi** (2.29 million pounds per square foot - 109,906 kPa). Thus, the design safety factor is 15,940psi/120 psi = 132.8 x. **This equates to nearly a 133 times safety factor for any street legal vehicle.**

Base Strength is Critical

All grass paving reinforcement structures are designed for two primary functions -

- transfer loads through the walls of the structure to prevent compaction, and
- provide small cellular confinement areas for optimal growth and protection of the grass root zone.

As with other forms of pavement design, grass (porous) paving must be provided with a rigid base below the structure to receive and spread the loads transferred through the structure. Some measurable load spreading capacity exists on the bottom of all grass paving structures, including the flexible grid of Grasspave², but we discount this value to simplify calculations and further increase the safety factor.

Calculating the depth and composition of materials for the base course incorporates the same design criteria as for other pavements, such as:

- load bearing capacity of native sub soil,
- plasticity or impact of moisture,
- frost heave potential,
- traffic frequency and/or duration.

Golf carts and pedestrian traffic may require a thin base course (perhaps nothing over sandy gravel soils) which may amount to 2" to 4" (5 - 10 cm) over very weak soils. Buses, trucks and fire trucks can easily require 8" to 12" (20 - 30 cm) or more depth of base course, and frequently the use of a geotextile below the base to prevent integration with sub soils.

Load Factor Equivalents

Assuming a given tire pressure of 120 psi, the following load factors would be equal:

- 17,280 lbs per square foot
- 8.64 tons per square foot
- 20,000 lbs per axle (4 tires)
- 432% of H10 rear axle load
- 216% of H20 rear axle load

Grasspave ² Compared to Loading Values					
Product	psi	psf	US Ton/sf	kPA	tonnes/m ²
Standard Truck Tire	120	17,280	8.64	827	84
Standard car Tire	40	5760	2.88	276	28
Fire Truck Outrigger	80	11,520	5.76	552	56
DC-10 Airliner	250	36,000	18	1724	176
Grasspave²	15,940	2,295,360	1148	109,906	11,207
Concrete	3000	432,000	216	20,684	2109

Note: an H20 Design Vehicle is theoretical and does not really exist. The axle load would be illegal on most public highways.

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1600 Jackson St., Ste 310
Golden, CO 80401
800-233-1510
invisiblestructures.com

