

Re: Pyramid stone?

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- *From:* Eric Stevens <eric.stevens@xxxxxxxxxx>
 - *Date:* Wed, 13 Jul 2005 17:09:06 +1200
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On Wed, 13 Jul 2005 02:02:36 GMT, Philip Deitiker
<Donevenask@xxxxxxxxxxxxxxxxxx> wrote:

>"stevewhittet" <whittet@xxxxxxxxxxxxxxxxxx> says in
>news:D_ednV9X0cK3w0nfRVn-jw@xxxxxxxxxxxxxxxxxx:

>
>> Actually they are more like 70 tons, but the issue is
>> that unlike the Queen Mary they aren't hollow. The
>> Queen Mary displaces enough w3dwr that it floats.
>>
>> If you were to try to lift 150,000 tons with 12 cranes
>> bearing on say 1000 SF each of not mud or sand but
>> good solid gravel that can support 2500 PSF you
>> would simply drill a dozen holes in the ground
>> with the cranes.
>
>Not necessarily so, if you put footings under the cranes.

He has already defined the support area. You can't go adding to it now.

>
>>> So essentially your argument is that we can build 150,000
>>> tonne ships on the banks of muddy shores then drop them into
>>> the drink, but moving a 60 ton stone 1/2500th that weight over
>>> sand is impossible.
>>
>> Exactly. When the ship is built its weight is spread out over 4
>> acres of ground.
>> Sliding it down a set of ways is possible, lifting it 240 feet
>> in the air is another story.
>
>It only doubles the strain.
>
>> The average home has a foundation that spreads its weight out
>> over a large area. Try lifting one twenty stories in the air.
>> The average crane won't do it.
>
>
>> While sand is an acceptable sub base for roadways where there is

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>> no chance of water getting into it, the subgrade soil fails in
>> shear when its shear strength is exceeded by a load, resulting
>> in a bearing capacity failure.

>

>Not if it is packed sufficiently.

Umm. Steve Whittet has given you a (correct) definition of failure.
Packing it more might increase its ability to withstand shear stress
but when it fails it will fail in shear.

>The big issue with sand as was

>discovered in the last SF earthquake ...

Well before that.

> ... is that the moment that sand is

>lifted up from where it has settled is becomes like a liquid, strong

>side or upward forces can do this, but if the sand is compacted

>greatly and the force is spread evenly, such as the addition of

>stones and aggregate on top the sand will hold as if it was solid

>material. The issue is getting maximum compaction.

The actual problem is the void fraction in the bed material. If the
void fraction is say 10% and filled with water, shaking will cause the
particles to rearrange themselves into a state of lower potential
energy (which is why the marble comes to rest in the bottom of the
bowl). This will be be more compact and the void fraction will be
less. The result is surplus water and liquifaction of the upper
layers. In an attempt to counter this considerable attention is paid
to the size grading of any basecourse or foundation material.

>

>> The shear strength of most subgrade soils is lowered as the

>> water content of the soil increases beyond optimal moisture

>> conditions. ...

>

>Not a big problem if you cover the road bed with a water proofing

>material like a mentioned a mortar on the top layer and some sort of

>firepit grease can be used to seal the joints.

The trouble is that the top layer prevents the road bed from drying
out and results in a generally weaker foundation. What the top layer
does is to reduce surface maintenance.

>

>> The issue is how to lift the stone. You could build it into the

>> Queen Mary and then after you launch your ship raise the water

>> level until the deck with the stone on it is at the right

>> height, but that's probably not an optimum system

>

>I was going to mention that.

>

> Consider the truck that brings the sand to my house, it is 12 yards

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>of sand? Ok so the 12 yards = 12 * 27 cubic feet of sand. 1728 cubic
>inches. 16.38 cubic cm per cubic inch. 9170703.36 cc * 2 for the
>density of sand and divided by a million = 18 tonnes. Drives on a 4"
>slab on top of mud, no problem, drive the back wheels off the
>driveway on fairly wet mud, still no problem. That is not including
>the weight of the truck. The contact area of the backwheels let us
>say 1.5 square feet per wheel, therefore the majority of the weight
>is covered by 8 wheels at 12 square feet. that amounts to about 1.5
>tonnes per square feet.

>
>
>
>

>>> We can consider the weight issue from that point of view.

>>

>>>A 747 has a Max take off weight of 362875kg (362 tonnes) and the
>>> runway from which it takes off is supposed to be capable of
>>> supporting that weight in case of an emergency abort or
>>> landing after takeoff, although theoretically the plane would
>>> jettison at least 35% of its fuel (issues with the tail
>>> section of the longer 747s and ground contact). Landing
>>> trajectory is on a glide slope of 300 meters/ 5 kilometer and
>>> the landing speed of the 747 at that weight is about 200 mph
>>> (320 km/hr, 88 meter/second) therefore the wheels of the 747
>>> would contact the runway at a verticle speed of about 5.28
>>> meters per second, this decelerates to 0 within less than 1/4
>>> a second, so or deceleration by about 3 g. This adds to the
>>> weight of 1 g for the aircraft and so that the total g force
>>> on landing of about 4 g, this has to be multiplied by the
>>> weight ofthe aircraft of about 300 tons make the initial
>>> landing force on the runway about 1200 tons by weight.

>>

>> A plan landing isn't a case of static loading. The load moves
>> at 200 MPH thus spreading it out over a much greater area.

>

>The instance the wheels of a 747 hit the runway they are not rolling,
>they are accelerated to speed thus increasing the force on the runway
>in that location. A 747 coming in hard, such as the 737 will
>probably have some tires explode on landing, the result will be more
>force on the remaining tires. A runway however is not only designed
>to take single impacts, but lower energy events at much more numerous
>frequency. Remember $E=hf$.

>

>> The negative moment spreads out like a wave. As to the plane,
>> its 362 ton load is divided up by spreading it out over 32 tires
>> separated into clusters which are a sufficient distance apart
>> that the point loads don't overlap.

>

>Wave energy is also energy, it can damage over time even more so than
>compression forces.

Eric Stevens

- *Follow-Ups:*

- ◆ *Re: Pyramid stone?*
◇ *From:* stevewhittet

- *References:*

- ◆ *Re: Pyramid stone?*
◇ *From:* Franz Gnaedinger
- ◆ *Re: Pyramid stone?*
◇ *From:* kenney
- ◆ *Re: Pyramid stone?*
◇ *From:* Philip Deitiker
- ◆ *Re: Pyramid stone?*
◇ *From:* stevewhittet
- ◆ *Re: Pyramid stone?*
◇ *From:* Philip Deitiker

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