

Greetings all

I was recently at a wedding where the ladies were all dressed in their finery, most wearing high heels. The wedding was an outdoor affair where we needed to walk on grassed areas.

I couldn't help but note with interest one lady's shoes. Fitted to the tip of her high heels she had "outrigger packing". (See the photo of something similar that can be bought).



"Outrigger packing" for high heels

It not only reminded me of why cranes need outrigger packing, but of a story my dad told me when I was little. He told me that the pressure a woman's high heel puts on the ground was greater than the pressure put on the ground by a fully grown elephant. At the time I couldn't really understand why. How could an elephant weighing 6 tonne put less pressure on the ground than a 60 kg woman?

So I decided to do the maths.

Doing the Maths

We use the formula: **PRESSURE = $\frac{\text{FORCE}}{\text{AREA}}$**

The ELEPHANT

If an elephant weighs **6 tonne**, and the average radius of an elephant's foot is 25cm across (.25 metres), then the **area for each elephant foot** is (using the formula **Area = $\pi \times r^2$**) is **.196m²**.



Therefore, if an elephant **stood on 1 foot** the pressure on the ground would be:

$$6t / 0.196m^2 = \mathbf{30.56 \text{ tonne} / m^2}$$

Standing on all four feet, this would reduce to **7.64 tonne/ m²**.

The WOMAN

If a woman weighs **60 kgs** and the radius of her stiletto heel was **12mm (.012 metres)** then the **area for the stiletto heel** is (using the formula **Area = $\pi \times r^2$**) is **.00045m²**.

Therefore, if the woman **stood on 1 heel** (as when walking) the pressure on the ground would be:

$$.06t / .00045m^2 = \mathbf{133.3 \text{ tonne} / m^2}$$

which is a much greater load than the elephant, even if it was standing on one foot.



An example of substantial crane outrigger packing

So if you are a crane operator and you're not sure why you always need to use outrigger packing, think of your crane's outrigger foot as being like a woman's stiletto heel. No packing and it will sink into the ground quicker than an elephant's foot.

More information on safe crane set-up can be found in the CICA **Crane Safety Manual** and the computer based training program "**How to Set Up Cranes**".

Cheers and stay safe!