

Greetings all. Today's Bulletin is about determining the suitable size for your Outrigger mat. Failing to do this can have disastrous consequences.

Outrigger pads or mats provide support for crane outriggers and help spread load to the ground.

**Working out the Outrigger pad or mat size is a 4-step process:**

1. Calculate the FORCE exerted on the ground by the crane (i.e. Manufacturer's software or (crane weight and attachments, plus load weight and rigging) x 0.65)
2. Obtain the allowable Ground Bearing Pressure (GBP) for the soil you are setting up on (one way of estimate the allowable ground bearing pressure is by using the table below)
3. Determine AREA by calculating FORCE ÷ PRESSURE
4. Find the square root of the area to determine the outrigger dimensions

Ground type	Maximum permissible ground pressure (t/m <sup>2</sup> )
Hard rock	200
Shale rock and sandstone	80
Compacted gravel—with up to 20% sand	40
Asphalt	20
Compacted sand	20
Stiff clay (dry)	20
Soft clay (dry)	10
Loose sand	10
Wet clay	Less than 10

**What load is the ground required to support?**

As a guide the QLD Crane Code of Practice states that the maximum outrigger force is the crane weight (including rigging gear weight) plus load weight, multiplied by 0.65.

1. Calculate the Force
 

55,000kg Crane weight  
 + 2,500kg Load weight  
 + 500kg Rigging weight  


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 58,000 kg Total weight

Example: (55t + 3t) x 0.65 = 37.7t.

Most manufacturers have their own lift planning software that can calculate the max load on each outrigger or crawler track based on the data entered.

Some will show the loads for each outrigger at slew angles of 45-degree increments.

This is reliant on the operator entering the worst-case load case. It is not always obvious which load case is the worst for outrigger loads, and an unloaded condition (min radius / no load) may often exhibit a greater outrigger point load than a desired load case. These ground pressure calculations can be difficult to work out and are susceptible to error because of their complexity and/or inexperience in the workforce.

**Working out Ground Bearing Capacity**

The current Qld Mobile Crane Code of Practice review identified ground pressure calculations as an area that needed an improvement in knowledge and guidance.

Two years ago the CICA Queensland Branch developed an app. which can perform the calculation and provide the user on site, with confirmation of the required mat size for the lifting operation or alternatively the pressure imposed by the crane to the ground (with known mat size).

This information is then captured and can either be sent to a supervisor for review or sent via SMS or email to be incorporated in the Safety Management Plan.

CICA Qld have made this app freely available to anyone who wants to download it.

Search for the 'CICA Outrigger App' to download.

**What size outrigger mat should we use?**

This is also known as the "Minimum area required under outrigger foot."

$$Area = \frac{0.65 \times (crane\ weight + load\ weight + rigging\ weight)}{maximum\ permissible\ ground\ pressure}$$

So, if we are working on shale rock or sandstone capable of supporting 80 t/m<sup>2</sup>.

$$Area = 37.7t \div 80 \frac{t}{m^2} = 0.47 m^2$$

This means that the outrigger mats need to be at least 0.47 m<sup>2</sup> (if square mats are used, then the mat should be at least 0.7m x 0.7m) to support the crane and load.



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*Note: you need a mat or timbers of appropriate thickness and strength.*

With any outrigger pad or mat, always follow the manufacturers guidelines for use.

If you still aren't sure on how to calculate outrigger loads, hiring a qualified lift engineer is a way of ensuring you have all the bases covered. They can calculate loadings accurately, compare load cases and produce lift plans and document accordingly.

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