CICA – Vic / Tas Branch
Crane Safety Bulletin
203
29 June 2016

Greetings all. Today's topic is **Theory of Crane Stability**.

There is a very good web site at www.vertikal.net that has daily updates of crane and reach equipment news from around the world. As well as news about new products and people in these industries, it also runs stories of incidents relating to cranes, EWPs and forklifts. Hardly a week goes by where there are not new stories about cranes or EWPs that have tipped over, or had major accidents, somewhere in the world.

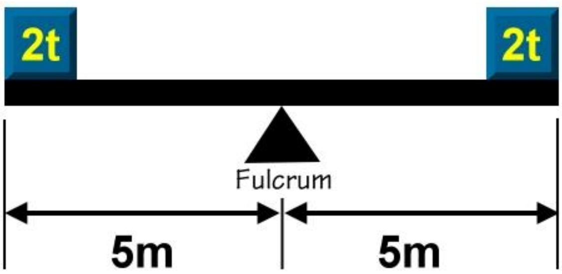
Many of these accidents occur when it would appear very basic rules have been ignored, which may indicate a lack of understanding about basic stability theory.

In past newsletters we have looked at topics on crane stability that relate to the setting up of outriggers correctly using appropriate packing and making sure outriggers are extended and pinned correctly (where pins are fitted).

But here we will look at the very basics of crane stability. Why do we have counterweights and outriggers at all? How do they help?

In the diagram below a common see-saw is represented. In the centre of the see-saw's plank is a fulcrum or pivot point. If the distance from the centre of this point to each end of the see-saw is the same (5m), and the weight on either end of the see-saw is the same (2t), then it will be balanced.

Mathematically the calculation for each end would be would be:
2t X 5m = 10 tonne metres of force on each end of the see-saw.

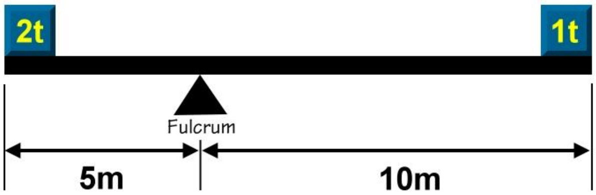


If we were to change the length on one end of the see-saw, then it would become unbalanced, unless we altered the weight as well.

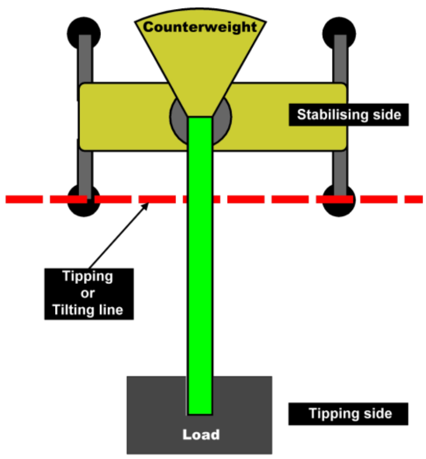
In the diagram below, we have doubled the length (to 10m) of the right hand side of the see saw, but halved the weight (1t) it is supporting – so it is still balanced.

Mathematically the calculation would be:
1t X 10m = 10 tonne metres of force on **right hand end** of the see-saw.

On the **left hand side** that calculation would be:
2t X 5m = 10 tonne metres – so therefore the see saw is still balanced.



This is pretty much the whole principle of crane stability.



On a crane, the fulcrum point (or tipping line) is the feet on our outriggers. This is the point over which the crane would pivot if it tipped.

The heavier the load – or the greater the distance the load is from the tipping line (the fulcrum point), the greater the forces are trying to tip the crane over. These forces are counteracted by the weight of the truck & counterweights on the opposite side of the tipping line.

The **wider** the crane's outrigger are set, **reduces** the distance to the load (from the tipping line) and **increases** the distance to the counterweights – thereby increasing the stability of the crane. A wider outrigger spread will always give a more stable crane – all things being equal!

Cheers for this week and stay safe.
www.cica.com.au