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Stopping that sinking feeling

c&a

mats

It is a truth, universally acknowledged that a mobile crane or aerial lift in possession of outriggers must be in want of a good set of outrigger mats. Unfortunately, too many owners and operators appear to be ignorant to this fact evidenced by the large number of machine topples caused by outriggers sinking or collapsing into the ground due to the poor set-up.



What is curious is that the vast majority of people understand the principal that if they try and walk in deep snow they will sink to their waist, unless they are equipped with snow shoes, skis or some other method to spread their weight.

Yet this almost instinctive knowledge does not appear to transfer to many supposedly well-trained crane and lift operators or users who continue to work without putting outrigger mats under each jack to spread the

Then there are those who think they can get by without a set of decent mats, making do with random off-cuts or other substitutes - sometimes waiting to see what they can find on site, should some cribbing be required. This in spite of the fact that the cost of a set of quality mats - which will last a lifetime - is a fraction of the purchase cost of the machine they help support. Thankfully safety authorities, such as the UK's HSE are beginning to clamp down on makeshift cribbing, shutting down

for big mobile cranes, thanks to the fact that they are relatively compact and versatile, not to mention their ability to pick and carry. When it comes to any crawler crane over 500 tonnes capacity - and often smaller - most contractors or crane suppliers, will insist on building a platform or mat for the crane to operate from as a matter of routine. Either to spread the track loads over a wider area or to prevent ground damage, particularly when working on public roads or close to the water table etc.

underground voids. Is the ground built up, reclaimed, or close to a slope which may give way? Are there any poorly backfilled excavations?



No matter how good your mats, running off the edge will cause problems

machines weight over a wider surface area.

Too many operators choose to gamble on the nature of the ground beneath them. If they have pads on board and they are not used, it is clearly out of sheer laziness or possibly ignorance - after all there is nothing to be gained by winning this 'throw of the dice' - and everything to lose. If they have rented the machine without thought to the ground conditions and the rental company has not asked them about it, the chances are that they will not have any mats even if they had a notion to use them.

jobs where it is spotted.

In this, our fourth annual feature on outrigger mats and roadways, we are focusing more on large mats used for working platforms for crawler cranes, large truck mounted lifts and mobile cranes or as temporary access roads. We also take a look at how poor outrigger set up is the root cause of so many accidents.

On a firm footing

Crawler cranes run the gamut from the smallest 900kg spider crane to some of the largest cranes in the world. At the top end tracks have become the undercarriage of choice

The smaller the crane the more likely the contractor and crane supplier are likely to operate it without any such platform. After all, smaller crawler cranes are typically selected for their low ground bearing pressures. The result is that ground conditions can often be overlooked with smaller crawler cranes and lifts.

However while tracked cranes and lifts are better at crossing soft ground and do generally have considerably lower ground bearing pressures than wheeled equipment, they can and do tip over when the ground gives way. So it is vital to know as much as possible about the make up of the ground with particular attention to any possible

Aggregates or wood?

Civil engineers will sometimes insist on the building of a properly engineered and calculated platform using a number of layers of well compacted aggregates on top of geogrid matting or even a concrete pad. While this may well be the right way to go for the very largest projects where a crane or cranes will be working over a long period, it can be both time consuming and expensive for shorter term work and requires a good deal of experience to get it right. A faster and far more cost effective - not to mention environmentally friendly - platform can be constructed from timber, or for smaller equipment aluminium or even composite mats that bolt together.



Who needs outrigger mats?



This one looks like it found a void. It also looks expensive

Timber mats (from sustainable sources of course) can be purchased or even rented in many areas, from a number of specialist suppliers. The benefits are that even a large, sophisticated mat can be constructed at short notice and then, if necessary moved or adjusted as the project develops. Timber is still relatively inexpensive and properly engineered hardwood timbers with edge protection and lift handles or eyes are incredibly versatile and can be adapted to all manner of challenges. They can also be moved from back to front while a

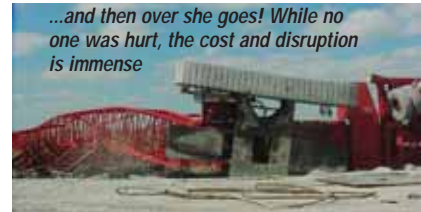
big crane travels, avoiding the need to cover the whole route or area. When it comes to the largest lifts, especially when a heavy load has to be lifted and carried, a combination of aggregates topped by timber is often used. The aggregate base can be used to both provide a foundation and help level the route, while the timber then spreads the loads and better handles the wear. Mats, platforms or pads are most often considered where the ground is soft and where the ground will clearly give way under any significant pressure. However other considerations



Aggregate platforms need to be carefully calculated and built or they can easily give way



Just over an hour later the crane begins to sink further...



...and then over she goes! While no one was hurt, the cost and disruption is immense



Crawler mount equipment can induce overconfidence. The person renting this machine would have faced a large recovery charge



These two Terex CC2800-1 are carrying out a tandem lift in Krefeld, Germany from an excellent aggregate and timber platform

include a surface that will wear badly and seriously erode with heavy traffic leading to problems later on. Both timber and aggregate

platforms can protect against this issue as can some composite mats. Aluminium and composite mats, panels or temporary roadways are

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A solid wood mat for one of the world's largest mobile cranes, the Terex Demag CC 8800

better suited for gaining access across soft ground, a challenge often faced with utility work such as erecting or maintaining remote pylons. The growth of wind power is also creating business for the providers of temporary roadways, particularly for smaller wind farms or even individual turbines where the cost of constructing a permanent road is not justified. There are exceptions of course. In the Netherlands and parts of northern Germany much of the ground is reclaimed or close to the water table and is just too soft. As a result the use of large timber mats is the norm. It is for this reason that so many Dutch companies are strong in this market. Most experienced crawler crane

achieved to some extent with a regular crane by adjusting the boom angle to balance out the counterweight. This is not always practical though and so understanding the ground and taking the appropriate steps becomes even more critical. The narrow tracked Liebherr LR1400/2-W - designed for wind farm work, avoids the turning problems, by installing a set of jacks to raise the crane up off its tracks, while a second slew ring allows the undercarriage to be rotated to the new direction of travel without disturbing the ground.

Who supplies?

The better suppliers of timber mats, will not only supply standard sizes from stock, but will also help with



In this case a 1,350 tonne fully rigged crane tipped, it looks as though it was front heavy, while a few steel mats have been used haphazardly to no effect

operators fully understand the dangers of moving a fully rigged crawler crane particularly on unstable ground and particularly when the crane has to turn. In spite of this a surprising number of crawler cranes do tip over every year, purely due to ground conditions. The majority occur when the fully rigged machine is being moved, when it is either front or back heavy, concentrating the loads on only part of the track. Manitowoc's new 2,300 tonne Model 31000 automatically adjusts its counterweight in order to keep the machine's weight - or centre of gravity - balanced over the centre of its four tracks. This can also be

the mat design and calculations and modify or adapt the timbers for specific challenges. In the UK, Dutch owned Sarum Hardwood - Mat and Timber services, has been operating for many years and has enormous experience in providing both mats and outriggers pads. It stresses its credentials in sourcing its hardwoods from sustainable sources and focuses its efforts on wood. Locally owned Timbermat of Stockport, Cheshire, considers itself a full line specialist in temporary surfaces and while offering the full timber mat service, also sells or rents a whole range of alloy and



This mat both spreads the load, protects the wet surface from erosion and reduces wear and tear on the crane's tracks

composite temporary roadways and even modular car parks. TPA, part of the Vp group, tends to specialise in temporary roadways and ground cover but is also equipped to design custom pads for cranes and lifts. Finally the most recent entrant into the UK, Welex, is also Dutch owned. Celebrating its 40th anniversary it has recently established new operations in both the UK and Germany and can offer a wide range of its Ekki hardwood mats for both sale and rental.

Go for quality

All of the timber specialists warn against buying some of the cheaper timber that is currently coming on the market stressing that it will almost certainly prove to be a false economy. This is particularly true in northern Europe, where timbers that split and damage easily, are then prone to freeze/thaw damage through the winter further undermining their integrity.

Coping with outriggers



Aluminium road ways from companies such as TPA, Eve and Timbermat are well suited for wheeled cranes and lifts to gain access over soft ground.

the ground conditions or pad size, in order to create a positive habit. Some equipment, particularly loader cranes and small truck mounted lifts are often equipped with small or even no pads at all, with the outrigger jack 'foot' being hardly larger than the diameter of the cylinder rod. In spite of this many loader crane operators do not seem overly bothered to use mats. It is true that most of the time they do operate on good solid ground and that, unlike mobile cranes, they are not usually required to lift the truck clear of the ground. However, too many operators

Typical timber sizes for mats	
Light to medium duty -	70mm x 1m x 3m
Medium duty -	70mm x 1m x 5m
Medium/heavy duty -	100mm x 1m x 5m
Medium/Heavy duty -	200mm x 1m x 5/6m
Medium/Heavy duty -	225mm x 1m x 6m
Heavy duty -	250mm x 1m x 6m
Heavy duty -	300mm x 1.2m x 6m

We have campaigned for several years now on the importance of using outrigger mats under the outriggers of any piece of equipment. This is clearly more important with some machines than others. Some cranes or more particularly lifts, are equipped with very large built-in pads which can cope with all good to firm ground conditions without requiring a separate mat. However many owners feel that it is good practice to use a mat regardless of

appear to give no consideration at all to the ground conditions, even when setting the stabilisers on grass.



Loader cranes and small truck mounted lifts often have only a minimal built in pad

New standards will help

The better operators tend to understand the risks but it is surprising how many still fail to comprehend the need to spread the load. New European standards for loader cranes dictate the manufacturer's maximum loadings permitted on each outrigger which could go a long way to solving this issue. Some, particularly the larger models, will still require the use of separate mats, so the challenge of how to get operators to use them will remain.

The statistics are clear

Numerous studies of crane and vehicle mounted lift accidents clearly show that the majority are ground or stability related - in other words tied into the improper use of outriggers. Accurately extracting this information from official statistics is notoriously challenging, as the causes are often poorly recorded. 'Crane collapse' is often given as a reason, regardless of whether it was due to a structural failure, (rare), the fact that outriggers were either not extended or only partially extended, or from overturning after the outriggers have sunk into soft ground or broken through into an underground void.

Having reported on crane and lift accidents from around the world over the past six years and studied numerous safety/accident reports and studies we estimate that around 65 percent of all wheeled crane and aerial lift accidents are caused by or are related to outrigger misuse.

The interesting fact though it is that there is a clear differentiation between such accidents in North America and those in Europe/Australia. In North America a significant number of the accidents are still caused by the operator not extending the machine's outriggers at all. While in Europe the outriggers are generally used - on many units due to interlocks being fitted - and the accidents that do occur are more often caused by outriggers sinking or punching through into an underground void.

Some of this differential can be attributed to a difference in the type of cranes most commonly used and the way they are operated. North America has a massive population of Rough Terrain cranes which can

be widely used 'on rubber' and mistakes arise such as slewing with an extended boom or load without setting the outriggers. In addition many of the cranes are owned or bare leased and operated by a variety of people, some with little knowledge of the particular crane. True, this is changing as more states insist on certification, but there are still a lot of 'casual' operators on site. In Europe and Australia road going cranes are more prevalent, most with limited or no on-rubber duties so outriggers tend to be set for most lifts and on arrival on site. It is also more common to rent the crane with an operator who tends to stay with that particular crane and is therefore a great deal more familiar with it.

That sinking feeling

In more than 90 percent of the accidents we have reported on where cranes have tipped over due to sinking or collapsing ground, NO



outrigger mats were used at all. While it is a gross and perhaps crass oversimplification, it seems that as long as an outrigger mat is used (at least one larger than the outrigger pad) a tip is unlikely.

It could be of course that those who routinely use mats are simply more aware of the dangers and therefore take precautions and as a result never appear in our online accident gallery? Whether our simplistic

conclusion is flawed or not, one thing is for sure, those that do not use mats are more likely to tip their machine whether it is a crane, aerial lift, telehandler or even a concrete pump.

Our conclusion also helps overcome the challenge, often thrown up as an objection to supplying mats for non-operated equipment, that a rental company cannot know the ground conditions and cannot therefore supply the right size of mat. If a mid-sized mat for the

so the real the percentage is considerably higher. Looking at the other causes - 25 cases were due to poor management and two of the key causes within this category were lack of proper site assessment and insufficient checks and measures to address ground conditions, while another cause included the incorrect set up of outriggers and the overriding of interlocks.

Looking behind the type of accident into the causes, the study highlighted three key reasons: a surprisingly high 48 percent of accidents involved a violation of rules and regulations; 26 percent a lack of knowledge and 26 percent human error. This also reinforces what we have noticed in accidents that have made it into the press. In many cases where cranes or lifts have tipped over due to mats not being used, a full set are clearly visible - stowed on the machine. The operator was, one assumes too lazy to use them or gambling that the ground was firm enough not to require them.



A nice set up with pads close to hand - shame they are not being used.



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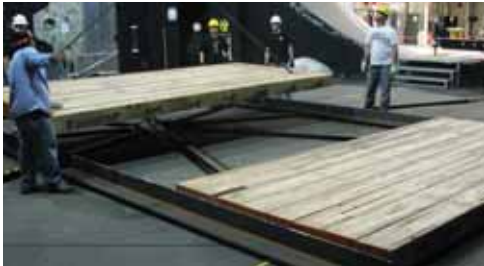


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So what is the solution? If we could only ensure that proper mats and cribbing are always used, we would almost certainly see a significant fall in the number of accidents that occur. One suggestion made recently was that cranes and lifts be fitted with sensors that detect the machine beginning to tip or tilt. While this is a logical use of technology we would prefer to see a rule that required all equipment fitted with outriggers, to be supplied with a set of mats or appropriately

large built-in pads and more emphasis given on the importance of using them. The rule to limit maximum ground bearing pressures might also help. And finally more training on crane and lift set-up and cribbing techniques.

What do you think?

In two separate polls on Vertical.net we asked 'Should the use of outrigger mats on cranes and lifts be mandatory' 81 percent of the 966 respondents said Yes.



Then when we asked rental companies if they supplied outrigger mats with all of their machines that were fitted with outriggers just 54 percent or 98 respondents said Yes - so just under half of all rental companies simply do not supply them.

Anecdotal evidence suggests that the yes vote was higher than the reality, with the majority of companies not supplying them.

Interestingly almost all cranes and large truck mounted platforms

which are supplied with operators do at least go out fully equipped with proper mats and cribbing materials. It is the non-operated/self-drive equipment - smaller truck mounts, trailer lifts, spider cranes and lifts - that are rented without mats. A large number of loader cranes although 'operated' are also not suitably equipped, although the better fleet managers do equip their units with a full set of good quality composite mats.

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