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Stopping that sinking feeling

Over the past few years numerous official and unofficial reports have identified ground conditions and poor outrigger set up as the single greatest cause of crane accidents and one of the most common causes of aerial lift overturns.

While plenty of incidents are caused by the operator not extending a machine's outriggers sufficiently for the capacity required, or not setting them at all, the most common outrigger related incidents are due to a failure to take ground conditions into consideration. This is also a significant factor in self-propelled lift and crawler crane overturns.

What is clear from all of this is that operators around the world are making basic errors far too frequently. In fact it could be said that over 99 percent of all outrigger related incidents are completely and easily avoidable with just a little basic forethought or planning. Why 99 percent and not 100 percent? There are a few exceptionally rare cases where the operator is doing his job exactly as he should and a structural failure occurs that could not have been picked up in a routine inspection. When this does occur it is usually related to an earlier structural overload, or more frequently repeated structural overloading that eventually leads to fatigue and failure.

99 percent of incidents are easily avoidable

By far the most common cause of outrigger related accidents is a lack of attention to the ground conditions and the ground pressures exerted by the outriggers. All too often it is down to the operator not using an outrigger mat of any kind. Good practice says that - unless you are on a test bed which you know to be designed specifically for the pad loadings you are applying - a spreader plate or mat should always

be used. As to the size of the mat, that depends very much on the ground of course and the loads to be applied. There are plenty of charts that allow you to calculate an appropriate sized mat, the latest being IPAF's Ready Reckoner for aerial lifts.



IPAF's Ready Reckoner is online and very easy to use.

The bigger the lift, the more detailed the planning needs to be for the support structure. On smaller cranes and aerial lifts - let's say up to 50 tonnes capacity or 40 metres working height - carrying out routine and predictable work on fairly typical terrain, the use of a 400 to 600mm circular or square mat will be more than adequate for normal firm ground conditions. However when working on grass, built-up ground and places where there is a clear danger of voids careful assessment is needed and if in doubt the use of larger mats. For larger cranes - say up to 100 tonnes - and platforms up to 75 metres, a set of mats with a diameter of between 600 and 900mm should handle most everyday situations - but as always it is best to use tools and charts provided by manufacturers.



Outrigger incidents caused by structural failure are exceptionally rare



This incident was caused by putting the jack down with no spreader of any kind - in spite of its miniscule size



The online news service on www.vertikal.net receives hundreds of accident photos and reports a year, most of them caused by an outrigger problem of some kind. Only in a very tiny majority of cases has the ground given way when a mat has been used, almost regardless of its size. In most of the incidents the operator has relied exclusively on the pad fitted to the bottom of the outrigger jack, even when its diameter is hardly greater than that of the cylinder rod itself!

We have had discussions with a number of rental companies in the past year or two who have deliberated over what size of mat to offer with the machines they rent and as a result have refrained from offering any mats at all. And yet as we have said the evidence suggests that the use of any mat that increases the surface area of the outrigger foot/installed pad will go a very long way towards preventing a ground related accident.



For most small cranes or medium height aerial lifts a modestly sized quality mat will cover most work

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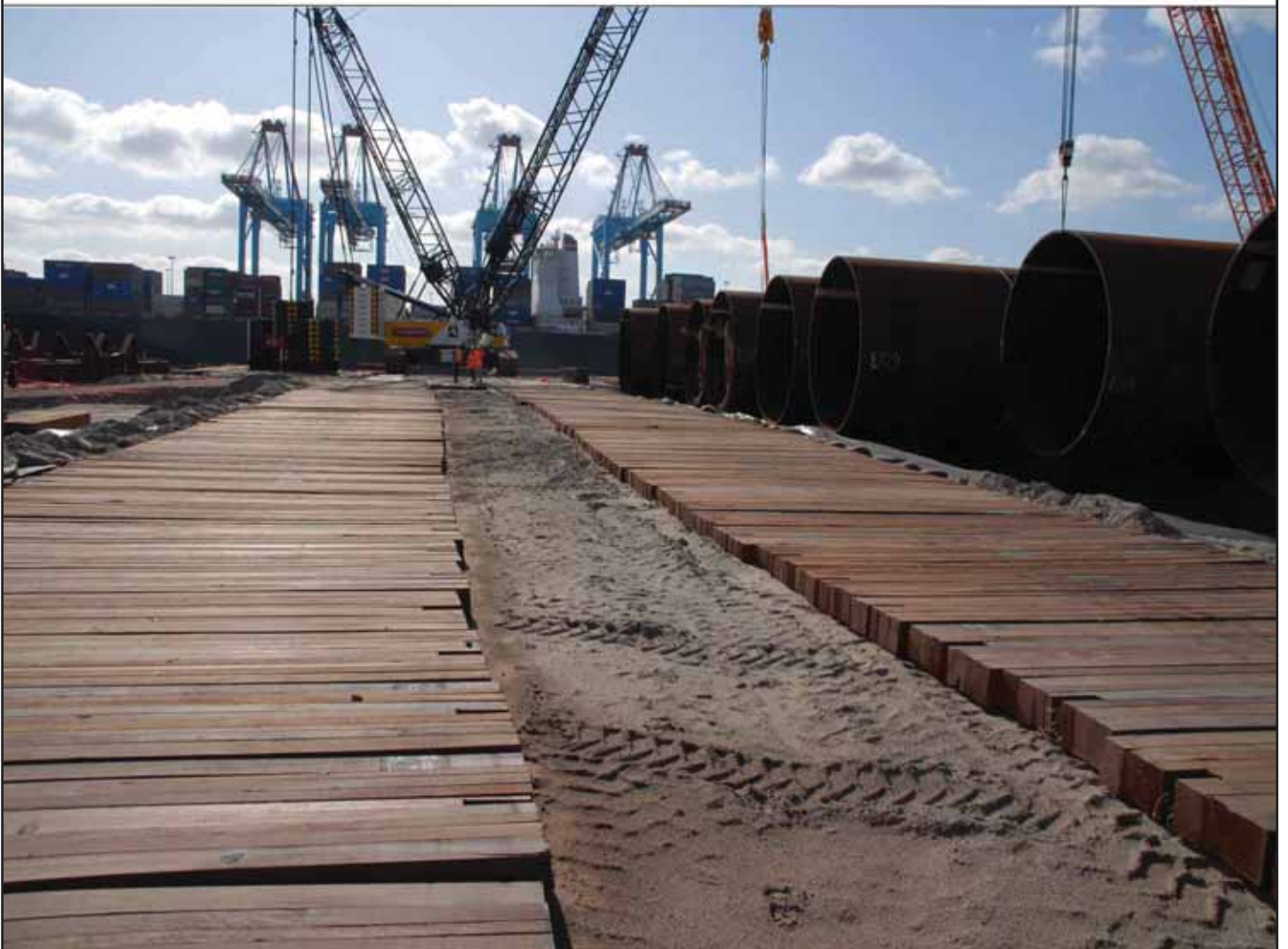
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Lower Drayton Farm

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T 01785 713675, F 05603 422006

Welex@Welexrental.co.uk, Welexrental.co.uk





While this operator got away with it - this time - this is a case of laziness. Good mats are provided along with cribbing, they are readily to hand in a decent storage frame and yet he has only used one of them. The other possibly prompted by its proximity to void?

So if it is this simple why isn't everyone doing it?

Good question. The two biggest explanations that spring to mind are laziness and ignorance. While that might not make us popular with crane operators it is a fact. We have seen dozens of overturned cranes where the outriggers have sunk into the ground and yet a perfectly good set of mats are stowed unused on board. If that is not an example of a bone lazy, ignorant operator then what is? In most European countries where the vast majority of cranes are supplied with operators, crane rental companies now install a full set of mats and extra cribbing on board in storage racks that make it easy for the operator to get them out and store them so they can and do get used on every job. Although there are always exceptions!

Ignorance is mostly seen where operators lack any decent training and have simply picked up operating skills along the way or learnt from an equally ignorant operator. There are also examples of operators who should absolutely not be allowed near a piece of lifting equipment. They simply lack any sense of risk, 'feel' or aptitude. I recall a presentation some years back on the benefits of using crane simulators in the training or even

recruitment of crane operators. The presenter had clearly failed to convince the sceptical audience of hard-nosed crane men that simulators could play a role in operator training, and yet one point he made that everyone clearly understood was how simulators can identify people who lack any aptitude for the job and who should never be allowed to go near a real machine.

Good operators have a 'nose' for the ground conditions and what measures need to be taken and when extra special care is required. For example hidden, undocumented, underground voids can always catch you out and yet there are usually clues to the likelihood of them being present. A simple example of this is large old buildings where the chance of there being a cellar, crypt or tunnel is quite high - certainly higher than alongside a new industrial building on a greenfield site. Evidence of ground disturbance, unexplained pipes sticking out of the ground or cracked concrete and asphalt are all indications that an experienced operator will pick up on almost subconsciously. On the other hand a poor operator will miss everything and will lower an outrigger jack with a tiny pad onto lush green grass



This operator in charge of a 500 tonner clearly has no concept of feel for what he is doing - he is a danger to the public



The odds of finding the a void in a graveyard or close to a church wall are about as high as they come - yet it does not occur to some



Lush green grass is another give-away

Sand is another No-No - even with its larger fitted pads placing them on soft sandy soil was never going to work.

without a second thought for whether the ground will support it.

Technology will help

While the clear solution to eliminating outrigger incidents is more training on ground conditions and cribbing etc.. along with a policy that makes it a fireable offence to set outriggers without mats, it looks like technology will play an increasing role.

The new crane & derrick rules in the USA that come fully into force in 2014 effectively stipulate that mobile crane outrigger beams must be equipped with sensors or monitors that clearly indicate their position relative to the various load charts available with a hint that interlocks ought to be fitted. Meanwhile in Europe loader crane regulations now demand that appropriately sized pads or mats are fitted to cope with the ground conditions that the machine is likely



to encounter. As a result most manufacturers are quickly moving towards outrigger position indicators that are fully integrated with the cranes overload sensing system. This is also the trend with truck mounted lifts which offer variable platform capacities and jacking widths.

Simple outrigger interlocks have long been a requirement on aerial lifts and there is no question that this has had a substantial impact on reducing the number of overturns caused by a failure to use the outriggers - almost to the point of eliminating them.

Additional features that may have a future role to play for all lifting equipment that relies on outriggers for stability are now becoming main stream in the European loader crane market. They include the use of informational input to sense a change in ground conditions often before the operator can see it. This can be from fairly simple tilt sensors that are tuned into the chassis flex characteristics, so that any additional or unusual change in deck angle provides a warning to the operator to take note and take action to prevent the situation deteriorating - by halting the lift function for example - to more sophisticated sensors that are linked to outrigger jack hydraulic pressures, so that a steady drop in pressure indicates that the ground is giving way or there is an oil leak.

While all this technology can and clearly will help improve the situation it is no substitute for a well-trained, highly skilled operator who knows his stuff. In North America where load moment indicators and overload cut-outs have been relatively recent introductions compared to Europe, adoption of such technology has often been resisted on the basis that it takes control out of the hands of the operator who should make any decision as to how

to operate his machine. While this is true, few operators are so good that they can 'fly blind' and if they did they simply would not get the most out of today's sophisticated cranes or lifts. The combination of better operators and improved technology will eventually eliminate the senseless number of accidents we put up with today.

some examples of good and bad outrigger set up



While an effort of some sort has been made here - this really will not do



Soft ground needs mats - even for crawlers



Small crane big pad - better to be safe than sorry, especially in a city where voids are certain



A nice set of steel fabricated mats - ideal for larger cranes



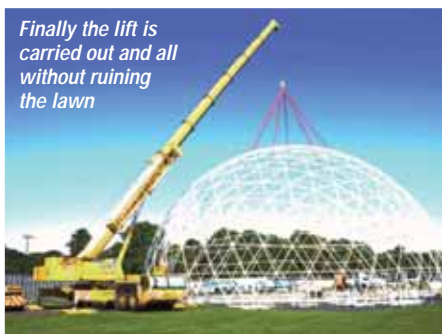
Operating with large cranes so close to such an excavation is gambling



The crane sat its regular steel mats on top of the Tufftrak mats



The temporary access road



Finally the lift is carried out and all without ruining the lawn

Crossing Clapham Common

UK-based ground protection specialist Grassform Group of Ingatestone, Essex was recently challenged with providing a solution to allow a 250 tonne crane to travel over the park at Clapham Common in London to rig a 36 metre dome for Sky 1's Let's Dance TV programme.

It supplied 750 linear metres of Tufftrak mats for the temporary access road used both for the crane and the numerous heavy trucks that delivered everything for the event and for the cranes lifting pad. The Tufftrak mats used were 3.0 x 2.5 metres x 40mm thick with heavy duty grip on one side for vehicles and a pedestrian surface on the flip side. Each mat can be bolted together to form many configurations of road width from 2.5m to three, five or six metre widths and built to any length required. The mats are made from recycled plastic.

Grassform's smaller mats were used for the car parks for the production crew, while pedestrian areas around the cabins and audience areas were covered with Porta path which can be clipped together in any dimension to form seamless non slip walkways.

Grassform's managing director Mark Dunning said: "This was a fantastic and challenging project with many different flooring solutions required to meet our clients brief. The install programme was cut in half due to a planning issue on the Dome, however our crew rose to the challenge and pulled out all the stops to install the flooring in record time so there was no knock on effect for our client."

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Tel: +44 (0) 1449 674 154 Mob: +44 (0) 7885 020 582

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Grassform prides itself on supplying only the best products to the landscape industry to match our unbeatable service. With over 25 years of experience in ground protection we are a one-stop-shop be it temporary or semi-permanent, our sales team will be happy to assist and advise.



Tufftrak mats 3.0m x 2.5m x 40mm heavy duty mats for trucks and plant available for short term hire with full install service. Up to 150 tonne loading ideal for roads, concerts, events, cranes etc. Quick to install and bolt together.



Trakmats 2.44m x 1.13m x 12mm medium duty man-handleable mats at 33kg per board for short or long term hire from £100 per day. Easy to connect and ideal for grass protection, car parks, paths, compounds, access tracks and event.



Portapath, the seamless pedestrian ground protection product that can cover marquee floors, trade stands, paths or football pitches. Can be used inside or out in any dimension.




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Nylacast LLC
770 Maple Street . Lebanon PA 17046 . USA .
t: 001 717 2705600 e: engineer@nylcast.com

Nylacast South Africa
PO Box 30445 . Jet Park . Johannesburg . SA .
t: 00 2711 3977077 e: engineer@nylcast.com



No mats required

Spierings, the self-erecting tower crane manufacturer has long worked to ensure that its cranes are ready to go within 10 to 15 minutes of arrival on site. One of the time saving features it has used to help make this happen, is the use of very large pads of a size equal to a decent sized mat. The operator simply pulls a pin and slides the pads into the working position over the centre of the jack and goes to work, no lifting or placing required. Softer ground will of course require mats.



A new mat system

UK-based outrigger mat supplier PLC Sales has launched a new mat option, offering two standard sizes within the ECO Lift Multi Mat System. The first provides a 2.25 square metre support area, comprising of a set of mats of 1,500 x 500 mm with a thickness of 50mm, while the second comprises a set of 1800 x 600 x 50mm thick, mats offering a 3.24 square metre support area.



The first three slim mats go down



Then two in the opposite direction



And finally it is topped by a standard mat

The mats are arranged with three alongside each other, followed by two at 90 degrees to the bottom three as shown in the pictures below. Finally they are topped with a standard circular mat. 20 mats are provided in each standard set. Single sized outrigger pads of 1500 x 1500 x 100mm or 1800 x 1800 x 100mm are extremely heavy and often require secondary transport to handle. Bill Green of PLC Sales said: "This new system is very simple, easy to handle as the heaviest item weighs 36kg, extremely cost effective and are not likely to be stolen as is often the case with steel or aluminium systems, which are then sold as scrap for cash."

Handling big mats

The standard mats supplied with most cranes and aerial lifts are too small for soft ground such as the sandy soil and reclaimed land prevalent in Holland or when working in certain sectors such as the petrochemical industry. Larger mats can be tricky to safely store on board and then are too heavy to handle easily. Hoogvliet, Netherlands-based Peinemann Hoogwerksystemen has devised an imaginative solution to this which it has applied to its newly delivered 90 metre Bronto S90HLA truck mounted platform. Cranes & Access saw the system when it was unveiled at Verticaaldagen.



The Reedyk mini crane mounted on the truck

Large mats required for big machines are heavy - too heavy to be lifted and placed manually. In our outrigger mat feature last year we reported on Dutch access rental company Debru which had devised a special trailer with loader crane to tow behind its 70 metre Palfinger platform and carry large 2.4 metre long steel mats. While this cured the problem of lifting the mats into position, there was some debate as to whether such a trailer would be permitted in some European countries due to the various road regulations and vehicle taxing regimes.

"A major problem with large truck mounted platforms is the small size of the mats supplied with the machine," says Dik Advokaat, technical manager for Peinemann. "We need mats that give ground pressures of less than 10 tonnes a square metre to comply with petrochemical contracts and for soft, sandy ground. This equates to a requirement for four, 2.4 by 1.2 metre mats. Made of steel each weighs 200kg and they need to be positioned quickly and safely by one man."

His solution was to use a small, specially modified 500kg capacity Reedyk tracked mini crane mounted on the side of the truck, within the overall chassis width. In just one week Advokaat implemented his design which involved relocating the existing fuel tank and hydraulic valve blocks to a position behind the driver's cab, creating the space needed to mount the mini crane. A simple hydraulic mechanism allows the mini crane to be raised and lowered - for stowage/ deployment - and then it is swung 90 degrees so that once on the

ground, it can move away from the chassis on its tracks. Fortunately by moving the fuel tank and hydraulics there was enough room between the wheels to mount the crane and this is also the case for Peinemann's existing 61 metre Bronto as it uses the same chassis.

Creating an area to store the plates on the top of the chassis - which would not cause interference with the stowed boom - while being unloaded by the crane was the next problem. The solution was to install two hydraulically moveable frames - one on each side of the machine - that carry two mats each. The frames extend away from the centre of the deck, allowing the crane to unload the mats without any damage to the boom. The crane can then place the mats exactly where they are required.

The whole system - mini crane, mats and hydraulic frames - weighs about two tonnes so with a Gross Vehicle Weight of less than 48 tonnes, the six axle S90HLA has plenty of free payload to handle it and still be road legal. An added benefit is the crane is also on hand to help mount the basket winch if required.

Although this is the first production unit, Peinemann and Bronto have been working very closely together so that future units will probably be built at the Bronto factory and will be available as an option to all customers.



Rotated through 90 degrees



Peinemann Reedyk crane on chassis



The two extendable mat frames on top of the chassis



Dik Advokaat with the standard size mats



Repositioned fuel tank and valve block