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Managing ground conditions

In spite of the growing awareness for the need to ensure that ground conditions can support the outrigger or wheel loadings applied by lifting equipment, there appears to be more overturning incidents due to the lack of preparation than ever. For more than a decade, Cranes & Access has highlighted this fundamental problem and highlighted the need to use outrigger mats/pads which would almost eliminate the problem - even when working on soft ground or near hidden voids.

Let's get one thing straight from the start. Every item of lifting equipment - be it a crane, access platform, loader crane or telehandler - is perfectly safe and stable when operating within its design parameters and when set up correctly. If there is an incident, operator error is nearly always to blame. Incorrect set-up and misuse are the main causes of overturning, caused by the poor assessment of ground conditions, poor spreader plate selection and incorrect positioning of the outriggers.

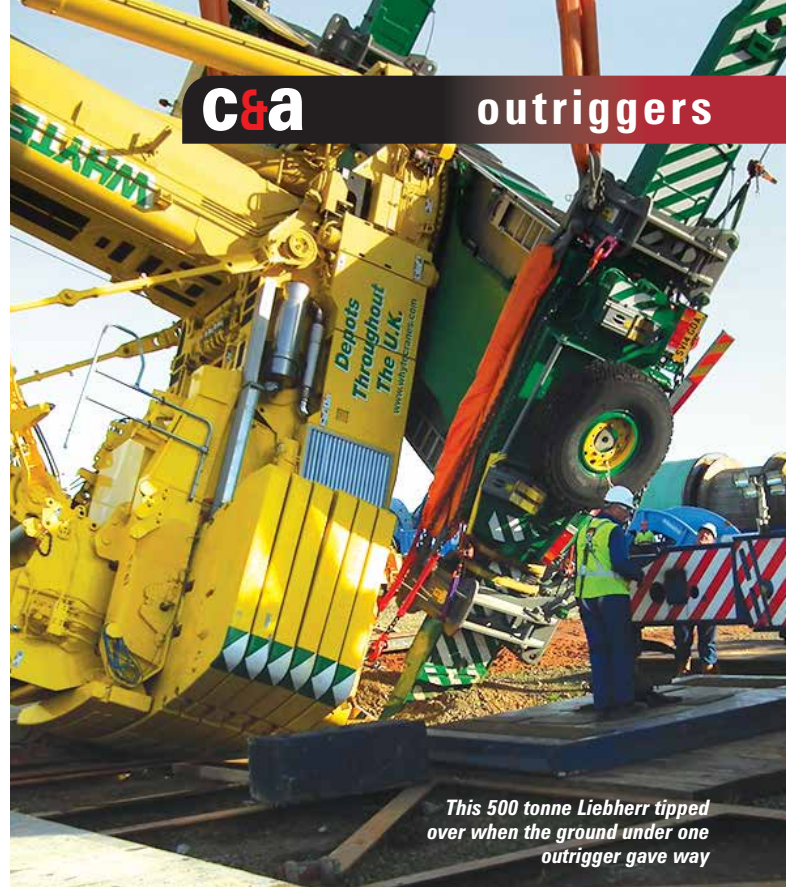
Although the discussion on equipment training is probably best left for another time, it is clear that even 'trained' operators are either unaware of the potential risks, or do not care about taking the correct steps when setting up and using the equipment.

It is admirable that training schemes

such as the IPAF PAL card are so popular, however if accidents keep on happening is this a reflection of a lack of experience or lack of sufficient training? As we have said many times before, training (particularly over just one day) does not equate to competency. Yes grasping the basics and operating a platform is easy, but using a range of different platforms in a variety of difficult situations requires experience, skill and familiarity. Something unfortunately many operators simply do not have, with many using the platform for a specific, perhaps one-off task.

Platform overturns

According to the latest IPAF fatality figures, 16 people lost their lives through equipment overturns in 2013 and this increased to 17 fatalities last year. After falls from height, overturns are the most dangerous aspect of operating a platform.



This 500 tonne Liebherr tipped over when the ground under one outrigger gave way

Surprisingly (or not) overturns from equipment in Category 1b (platforms with outriggers) were half that of overturns in scissors (Category 3a) and booms (Category 3b). Before we jump to conclusions there are many possible reasons for this, such as the fact that booms and scissor dramatically outnumber platforms with outriggers. Outriggers now have interlocks and the machines that use them - truck mounted and trailer lifts - are more complicated, meaning that a greater awareness is required - and often given. Many scissor and boom overturns are also down to working on slopes - still ground condition related - rather than being caused by sinking in soft ground or voids. When it comes to cranes of course almost all overturning machines are those fitted with outriggers.

The main problem appears to be the lack of understanding of the potential risks - both above and below ground level - when setting up equipment that utilises outriggers - or should that be jack legs or stabilisers? Even the terminology used in various standards and codes of practice can vary or sometimes is not defined at all as in EN280:201.

British Standards on the other hand describes the outrigger as "a device intended to increase the supporting base and level the machine in its operating position, while a stabiliser is a device or system to stabilise a machine by supporting and/or levelling the complete machine

or the extending structure. NOTE examples of stabilisers are jacks, suspension locking devices and extending axles".

However similar ANSI standards define outriggers as devices that increase the stability of the machine and that are capable of lifting and levelling it, whereas stabilisers are devices that increase the stability of the machine, but are NOT capable of lifting or levelling it.

There are also variations between manufacturers in manuals both in the naming of the outriggers/jack legs/stabilisers and the units of measurement for the forces - KN, N/mm sq etc... All very confusing.

There is clearly a need for consistency of definitions throughout the international standards, and perhaps guidance such as IPAF's 'Spread the Load' should also encompass different types of equipment - such as wheeled and tracked platforms - and not just focus on booms with outriggers as the basic principal of using a machine safely in various ground conditions still applies.



Spot the outrigger pads?

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A Hinowa 26.12 tracked boom belonging to UK based MBS Access using Hi-Viz pads during cleaning the glazing in Central Milton Keynes shopping centre.



Palfinger's P480 - stores each outrigger pad at the end of the outrigger.



A heavy duty pad arrangement

A comprehensive guide

Just over a year ago the UK's Strategic Forum Plant Safety Group produced the huge Ground Conditions good practice guide in conjunction with national associations such as the HSE, the CPA and CITB together, thankfully, with a four page summary. The document covers not only the ground below a machine's outrigger jacks, tracks or wheels, but also highlights the challenges of getting a heavy crane or truck mounted lift across uncertain ground to the working area.

The guide - aimed at the end user and site management and not the experienced operator - is

based around a flow chart which works through each process, such as defining the task, obtaining information on the type of ground, selecting the equipment and the load forces it imposes to determine the suitability of the ground and the measures to be taken. Its recommendations are not rocket-science - put simply if the ground is suspect use a lighter machine or spread the load. But the main problem is that many customers/clients and contractors are still not fully aware that ground conditions are ultimately their responsibility and that they should give the operator information such as the maximum ground bearing pressures that the ground will take.

Which spreader plates?

Depending on the type of equipment there is a mat/pad or mat system to suit. Manufacturers are now working more closely with customers to ensure that mats can be carried on a machine as well as being stowed in a position from which it is easy to remove and place them. Some of the larger truck mounted platform and crane manufacturers have incorporated outrigger pad storage areas low down on the machine and also use round outrigger mats to facilitate easier manual handling.

Palfinger's latest truck mount - the two axle, 48 metre P480 - has gone one step further by having each outrigger pad stored at the end of the outrigger so that it just needs to be dropped from each carrier and put under leg. This is an excellent system and certainly makes it easy for the operator. This is critical as in the vast majority of overturning incidents, no mats have been used at. And in many cases if it possible to see mats still stowed on the deck of overturned machines.

Larger mats for cranes and heavy equipment

The current trend in outrigger mats is towards the use of multiple component mat systems - such as that pioneered by Alimats in the UK - allowing users to build up a larger mat by linking a number of smaller, easier to handle spreader plates together. A number of new products have been launched by companies such as Outriggerpads with its ECO Lift Multi Mat System, Solum modular mats and Universal Crane Mats.

Aluminium UniMat

Universal Crane Mats launched its new modular system at Vertical Days in May called the UniMat aluminium load spread system. Its first set of mats - measuring two by 1.5 metres - was purchased by Highcliffe Engineering based in Mexborough, South Yorkshire which took 20 modules made up of 12 two metre and eight 1.5 metre long mats. This combination can make standard three metres square set of four pads of two metres by 1.5 metres.

Mat sizing is always dependent on ground conditions and varies for every lift so many customers will purchase a larger size than generally required in order to cover a larger proportion of lifts. Where the engineer dictates a larger load spread area to reduce imposed loadings, the customer can simply rent in additional modules as required.

The UniMat system has been successfully proof tested under simulated site application to 150 tonnes at Lloyds British Testing facility. Available in eight configurations - one, 1.5, two, 2.25, three, four, five and six metres square - the system is proving popular.



An innovative outrigger support system



The UniMat system has been successfully proof tested under simulated site application to 150 tonnes at Lloyds British Testing facility.



A selection of smaller outrigger pads.



The Solum a multi-purpose aluminium temporary foundations system with all modules 600mm wide and 70mm deep and available in 600, 1,200 and 1,800mm lengths.

Solum

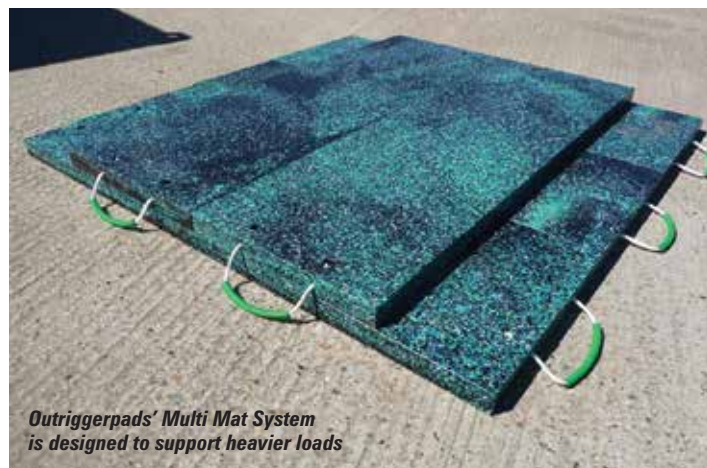
Another new launch at Vertical Days was The Solum - Latin for foundation - a multi-purpose aluminium temporary foundations system designed by RNP Associates. All modules are 600mm wide and 70mm deep and available in three lengths - 600, 1,200 and 1,800mm. The profiles allow the modules to be combined to cater for a variety of applied loads and supporting ground conditions. For example two units laid at right angles over three base units have a proven, tested working load of 100 tonnes. The largest configuration has been tested to a proof load of 1400kN (140 tonnes). With the largest modules weighing 38kg, 25kg for the medium and 13kg

for the smallest, the product which includes integrated end handles can be easily manhandled into position. In addition to providing a stable support for crane outriggers, the smaller units may be used to provide a load spreading support for falsework, truck mounted lifts or even loader cranes

The company says the advantage over steel pads in that Solum is installed manually before the crane is rigged. The alternative heavier steel pads often require the crane to lift them into position before the mats are in place therefore increasing the risk of sinking on soft ground. Furthermore the lightness of the aluminium mat system means that they can often be transported directly on the mobile crane, effectively removing the need for a support vehicle. Aluminium was selected, for its strength, weight and ability to resist corrosion. Even the largest mat can easily be transported in a van and laid in place by two men.

A bigger polyethylene mat

Outriggerpads has introduced an alternative to mid-sized steel



Outriggerpads' Multi Mat System is designed to support heavier loads



The Emtek panel is specifically designed for use in boggy and extremely wet areas

spreader plates/mats using composite material similar to that used in its regular mats. Measuring 1.5 by 1.5 metres they are manufactured from high density polyethylene (HDPE) which is resistant to water, oil and chemicals making them highly durable - and unlike metal or wood spreader plates, there is no risk of corrosion or splintering.

In order to make them easier to handle, the mats incorporate four metal bars, similar to better quality heavy timber mats, to allow for the easy attachment of slings. Although they weigh 214kg each, the company says they are considerably lighter than the equivalent sized steel mats, but have a greater load bearing capability. The company says that it is the first company to stock polyethylene mats of this size. It also adds that due to a positive reception it is moving into full production to ensure deliveries times are kept to a minimum.

First customer for the new crane mat was Towcester, UK-based

crane hirer Berry Cranes. Neil Berry, managing director, said: "We were impressed with the light weight of these mats and their load-bearing capabilities. I would expect them to have a much longer working life than steel mats. The integrated lifting bars also make them easy to unload and position."

Track panels

Outrigger mats are just one of the many products designed to help equipment work safely on a variety of ground conditions. Track panels allow equipment to reach parts of a site that involve crossing ground that is too soft to support the equipment or that will be damaged by the weight of the equipment. This sector, pioneered by Trakway has also seen the introduction of several new products.

American company Anthony Hardwood Composites has developed the Emtek panel - a temporary access roadway system, specifically designed for use in boggy and extremely wet areas which are now available in Europe.

The wooden mats are made using American hardwoods which are laminated, glued and pressed to create a super-strength panel, with natural defects such as knots and wane removed to add further strength and quality. The wood used within the mats is also sourced from certified sustainable forests.



Alimats interlocking modular load spread system.



The latest HDPE product from Outriggerpads measure 1.5m by 1.5m.

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FSC & SFI Certified Sustainable Timber Bog Mats.



Timbermat Ltd provides expert advice with over 23 years' experience in the mat industry and over 40 years in Civil Engineering. Ideally used for crane access and outrigger pads, Timbermat offer an extensive range in various sizes to suit every application. Our service is prompt and efficient with quick delivery throughout the UK and Europe.

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- Competitive rates for hire and sales, built around your projects budget.
- Superior quality Eki and Oak mats, manufactured to the highest standard.
- FSC, PEFC and SFI certified and sustainable timber used in all our mats.
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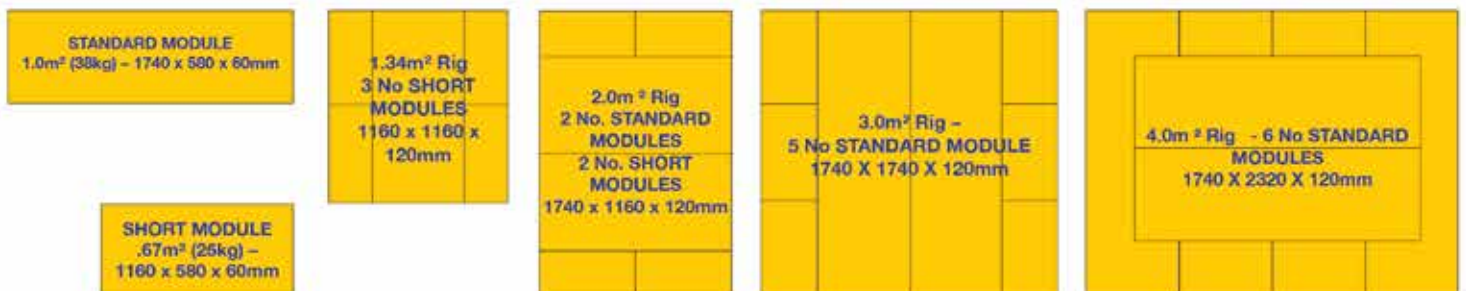
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- Interlocking modular load spread system
- Each standard 1m² panel only weighs 38kg
- Comprehensive safety documentation and load spread analysis available
- Easy to set up and manhandle around site
- Compressive Strength 530 tonnes / m²
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Large cranes are perfectly safe when set up correctly

All Emtek mats are proof load tested at the factory for deflection and strength. According to the company deflection tests carried out in comparison with aluminium mats showed the Emtek product deflecting three times less when put under the same load span pressure. With compressive strength, the mats are designed to support 4,123psi (290 kg/sq cm) on firm surfaces.

Zappmat

A new concept in ground protection mats - Zappmat has been launched

by UK based Paragon Protection Systems which has more than 20 years' experience in specialist construction plastics.

Four types of Zappmat are available - Pro, Go, Vibe and Life - all with varying specifications and features. At the top end, the Pro has a load rating of 140 tonnes and backed by a 10 year warranty. The Go is a more cost-effective mat rated at 80 tonnes, with a seven year warranty. The Vibe has the same performance as the Pro but is available in any colour which is being increasingly

used on sites to identify high risk areas and walkways etc. Finally Zappmat Life is made from a special translucent resin which helps protect grass from drying and other damage for use on quality turfed areas.

All Zappmat variants carry the same tread pattern with a vehicle tread

one side and a pedestrian tread the other. They are manufactured using 100 percent virgin HDPE - not recycled material - as according to the company polyethylene molecules don't always bond well to impurities found in recycled materials which can lead to stress-fractures or breakages.



Zappmat Life is made from a special translucent resin which helps protect grass from drying and other damage for use on quality turfed areas

Supporting Halley VI

Scientists at a renowned Antarctic research facility are using spreader plates to support researchers for the British Antarctic Survey (BAS), in the Halley VI Research Station - the first fully re-locatable research station in the world.

The state-of-the-art facility is segmented into eight modules raised on hydraulic legs which can be raised individually to overcome the accumulation of snow, preventing the station from being buried. The legs are all fitted with giant skis, so the team can tow each module using a bulldozer, enabling Halley VI to be relocated as required. Snow levels rise by more than one metre every year and the sun does not rise above the horizon for 105 days during winter. Temperatures drop to -56C and the site can be buffeted by winds in excess of 100 mph.

Telford, UK based Outriggerpads has created a product specifically for the research station. The pads measure 1,200mm x 1,000mm x 40mm and weigh only 46kg each making them easy to manually position, yet have a 30,000kg load-bearing capacity.

Manufactured from UHMW polyethylene, the material does not splinter - particularly important in such cold conditions, and has a very high resistance to vertical pressure, meaning the pads adapt to the contours of uneven terrain while still retaining their shape. The material is also completely waterproof which significantly extends the working life of the mats compared to spreader plates made of wood or metal.

Science at Halley VI provides vital information for better global understanding of ozone depletion, polar atmospheric chemistry, sea-level rise and climate change. Halley VI is the most southerly research station operated by BAS. It houses up to 52 people in peak summer (December to February) and a core team of 16 during the long winter when the base is completely cut off from the rest of the world, on the 150 metre thick floating Brunt Ice Shelf, which moves 400 metres each year towards the sea.



Outrigger pads help prevent Halley VI from sinking into the Antarctic snow

King Lifting uses VarioBase system

UK crane rental company King Lifting recently used its new 300 tonne Liebherr LTM1300-6.2 mobile crane with the VarioBase system to assist in the removal of a large tower crane in the City of London located on a very tight junction deep in the heart of the city. To reach the tower crane, the LTM1300 needed to be sited on the junction of Fetter Lane and a service lane and set up with 78 metres of main boom with an additional 14 metre fixed jib.

Once in position, the LTM1300-6.2 VarioBase system allowed each outrigger beam to be extended to the full extent allowed by the limited space with the information then sent to the Liccon load limiter where a corresponding load chart is then calculated and set in the system. In this case the rear outriggers were set at full width, with the front nearside at 50 percent and the offside at 75 percent, which allowed footpaths to remain open, street furniture to stay in place and fragile underground services to be avoided.

A crane using conventional outrigger positions would have necessitated considerable preparation work to the site hoardings and highway with associated time and cost implications. The VarioBase system allows the crane to operate safely with any support base, avoiding potential accidents resulting from incorrect operation or a poor set-up.



The LTM1300-6.2 VarioBase system allowed each outrigger to be extended to the full extent allowed by the limited space

The most advanced system technology...



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Powerful, flexible and reliable – Curtis AC motor speed controllers let you fully utilize the advantages of AC drive versus hydrostatic or brushed DC traction systems.



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Today's highly specialized controller technology can be challenging – even for experienced OEMs. Curtis has the right solution: an expert partner to work with you at every stage of leading-edge product development. Pictured here is Kerry Green of Curtis UK, a dedicated customer support engineer. He's a fine example of the talent we deploy worldwide to help OEMs specify, design and build high-performance industrial vehicles. Our global support network makes Curtis a reliable extension of your own engineering department. It's easy to partner with Curtis.

We are ready to help you.

