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CHANGING ATTITUDES TOWARDS MATS AND PADS

We have been promoting the use of spreader plates, outrigger mats and good cribbing for almost 20 years now. In recent years however, we have noticed a massive shift in attitudes across most developed countries towards the use of outrigger mats for cranes, aerial work platforms and even telehandlers. And while there are still too many overturning incidents related to ground conditions, their frequency has fallen dramatically. Today most ground collapse incidents we see are not due to the absence of outrigger mats.

One trend that has surprised us, is the number of major UK house builders, including David Wilson, Barratt Homes, Cala Homes and Vistry Homes, that are purchasing their own outrigger mats as part of the 'starter pack' for each housing development, ready for when cranes or work platforms arrive on site as work progresses.

Most of them seem to be ordering four 2.5 by 1.25 metre mats to provide 3.25 square metres of cover. The mats typically have a load bearing capacity of 60 tonnes, enough to handle cranes up to four axle 100 tonners, although on a housing development, two and three axle All Terrains, or two axle aluminium truck cranes are more typical. This is an obvious, simple and efficient solution to an age old problem and eliminates having to deal with cranes that arrive on site without proper mats or being asked to pay for them if the rental company treats them as 'extras'.

They also have built-in forklift pockets allowing them to be moved and placed by the site's telehandler.

The simple fact is that using outrigger mats - whatever material they are made from, steel, plastic or wood - reduces the risk of an overturning incident on site, which can so easily cause serious injuries, damage and delay. Any good outrigger mat used in the correct way, ideally on 'firm level ground', will do the job. And despite some in the industry poo-pooing materials other than steel or aluminium, there is little to no evidence of an overturn caused by mat failure, whatever the material. In fact, we began this regular feature after spotting that in almost every overturning incident we reported on, outrigger mats were either absent or still on the deck of the crane or platform.

There are also instances where a particular crane set up means using a 7.5 metre by 1.2 metre mat supported at each end by an engineered solution to span a pipe or other services, etc. While not designed to do this, some of the sturdier steel mats are more than capable, although load calculations need to be carried out to confirm the loads and mat sizes, etc.

It would appear that operators are more aware than ever of the importance of ground conditions when setting up. When it comes to self-propelled platforms however, all too many users seem blissfully unaware of the loads that can be applied to each wheel of a large boom lift. Walking the route prior to using the platform is essential to check for any problem areas such as drains and manholes, as well as uneven ground, kerbs and large stones or rocks, etc.

OPERATING ON THE LEVEL

Setting up a crane or platform when out of level not only increases the risk of tipping but also leads to other issues, including accelerated equipment wear.

US based outrigger mat and ground protection



manufacturer Dica has introduced larger versions of its LevelRight wedge outrigger mats. Chief executive Kris Koberg says: "The LevelRight mats provide a fast, reliable solution to stabilising outriggers on sloping terrain, eliminating the need for time consuming site modifications."

The LevelRight range now includes four sizes with diameters of 300mm, 600mm, 760mm and 900mm, capable of supporting loads of up to 159 tonnes. The mats can be adjusted to cope with slopes of up to 10 degrees in multiple planes and feature the company's 'SafetyTech' material along with 'SafetyTexturing' for improved pad grip. Each two part mat also incorporates a built-in bubble level for simple, accurate adjustment. The mats can also be used as a base for Dica's ProStack Cribbing Blocks when additional height is required while maintaining a level set up slopes.

MATS ON A ROLL

The increased uptake of outrigger mats has encouraged manufacturers to increase production to keep up with demand. In the UK, Power Pads is producing more large steel mats than ever while in the USA Dica has expanded its facilities with additional manufacturing space. ■

Another crane tip over - however it is obvious that it was not the lack of mats that was the cause





A SHIFT IN THE RIGHT DIRECTION

Dan Westgate, managing director of mat and ground protection specialist Brilliant Ideas, discusses the changing attitudes from crane and aerial lift users when choosing crane mats or ground protection.

When we first exhibited at Vertikal Days in 2020, conversations were very different from what we are hearing today. Back then, almost every question was about what the mats weighed and how much they cost. Fast forward to this year's event, and the conversations were dramatically different.

Now, visitors are asking about safe working loads, material properties and how different systems actually spread the load beneath the mat surface. That's a major shift in understanding, and it's one that's long overdue in the crane and lifting industry.

FROM SIMPLE SUMS TO STRUCTURAL SCIENCE

Five years ago, the industry norm was a simplified calculation. If I've got a 15 tonne outrigger load and an allowable ground bearing pressure of five tonnes per square metre, then I need a mat with an area of three square metres. Once that area was covered, few people questioned what the mat was made of or how it was actually performing in terms of load spread.

Today, those assumptions are being challenged - and rightly so. More and more engineers want to know whether the mat system is structurally fit for purpose. They're asking about stiffness, deflection, and how the mat behaves under real outrigger loads.

At Vertikal Days this year, this change in attitude flowed through to the visitors that came onto our stand, not asking about mat size or price, but about material stiffness, section properties, and the safe working load for each configuration. To us, that's a fundamental and very positive change.

WHY MAT SIZE ALONE DOESN'T TELL THE WHOLE STORY

There's a common misconception that safe working loads correlate directly with mat size - it doesn't. It's not just about area; it's about how

load is distributed through the mat and into the ground.

Take a five by one metre Ekki mat. On paper, it looks substantial, but its linear shape makes it poor at spreading a load. The forces simply take the path of least resistance. For example, when a pebble is dropped into water, it ripples out in even circles, which is not the case with an applied load, it will always run to the shortest distance, so linear mats are not ideal for this reason. The shape and stiffness of the mat in both directions are critical.

At one time, our business was focused almost entirely on simply renting out mats. Now, we want to know what size of crane is being set up on our mats. This question matters because outrigger load is a by-product of crane size. In simple terms, a 40 tonne crane at 75 percent produces a maximum outrigger load of around 30 tonnes, plus the weight of the load, which gives a realistic steer on outrigger loads.

Our aluminium modular systems have a clear window of suitability, typically up to 100 tonne cranes. Beyond that, we want an even deeper understanding of the outrigger loads that might be applied. Usually, anything above needs their own steel mats and, due to the material's inherent stiffness, can handle much higher forces. Some of our customers create larger mat configurations by utilising their travelling steel crane mats on top of our aluminium load spreader Alimats. Combining their strength and stiffness with their own steel mats delivers an ideal structurally efficient mat combination.

Again, five years ago, if someone with a 200 tonne crane asked for three square metre mats, we would have provided them without a second thought. Now we would question it because the by-product of cranes of this size is larger outrigger loads. That's the kind of shift we have made as a company along with the industry as a whole.



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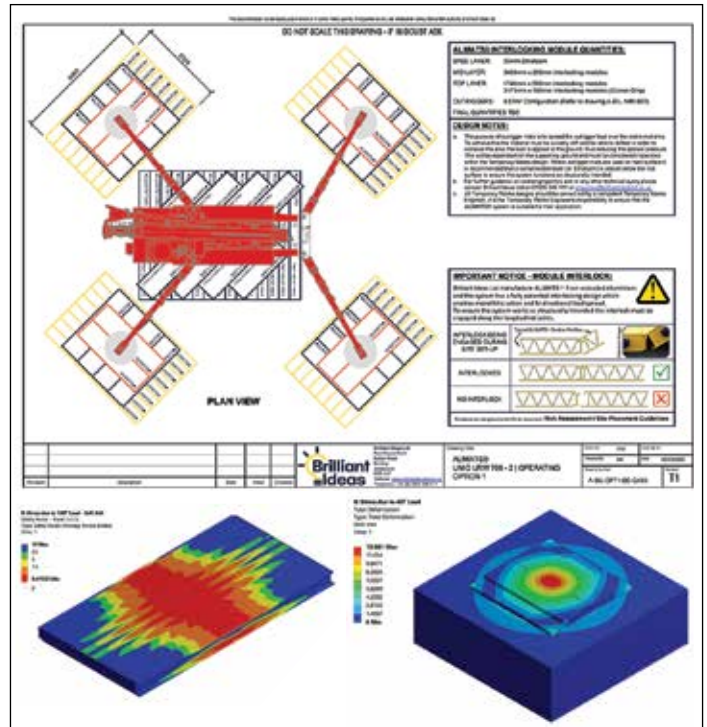


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PLASTIC MATS - THE WEAK LINK IN LOAD SPREAD

We've lost work to other mat systems in the past, particularly to plastic mats that look similar in size but make unrealistic claims. Our standard configuration, a 1.74 x 1.74 metre mat - three square metres - is one of our most popular configurations. Some plastic mats on the market are 1.8 x 1.8 metres, yet claim safe working loads up to 140 tonnes. That's simply not credible.

We've tested similar systems ourselves and found individual plastic modules reaching their elastic limit at around 1.25 tonnes (based on a simple bending test to check for material stiffness). We can only assume that these claims rely purely on the compressive strength of the material, not on its ability to spread load beneath the mat surface, which is what matters. Our theory around these claims is also supported by the Temporary Works Forum Safety Bulletin TW21.144 (Published 20th December 2021).

THE RIGHT QUESTIONS TO ASK MAT SUPPLIERS

So, what questions should you be asking when you talk to suppliers?

1. What's the stiffness of the profile?

This can be calculated from the cross section and material properties. For solid plastics, that's relatively simple. For structural extrusions like aluminium, it's more complex, and that's where physical calculations, verified section properties, and certified material data are essential.

2. What's the Safe Working Load /SWL - and how was it established?

Ask whether it's based on real testing, Finite Element Analysis, or first principal engineering calculations. All have their place, but results can vary dramatically depending on assumptions and testing conditions. For example, not all physical testing tells the truth. We've seen reports where a four square metre mat setup was tested on Ethafoam with a hydraulic jack taken to 100 tonnes. It sounds impressive, but all that does is bend the mat down to the base of the rigid test rig, forcing load through compression in a small central area. It proves very little about real world load spread.

The same goes for finite element analysis. We use it regularly, but it's not infallible. As one engineer said to me, "You get a hundred pages of data that





doesn't really tell you much." It is, though, useful when backed up by sound engineering judgement and practical understanding of how mats behave in the field.

3. How has the system been analysed structurally?

We have employed the services of an independent chartered engineer to perform first principal analysis based on a theoretical cantilevered design approach. That revealed, for instance, that the top layer of mats carries the highest stress, while lower layers share the load differently. This insight led us to redesign certain configurations, such as replacing long top mats with shorter ones in our six metre system to improve stiffness and increase safe load capacity. A further outcome of our analysis was the development of the Half-Loader module, which is an exceptionally stiff top profile component designed to enhance load distribution. It not only improves how the load is spread across the upper surface of the mat but also helps transfer forces away from the centre of the system, reducing localised pressure and increasing overall performance.

NO SUCH THING AS A FULL LOAD SPREAD

A question we often get from engineers is "How can you guarantee full load spread across the mat surface?" and the honest answer is - you can't.

That would assume a material of infinite rigidity, something that doesn't exist, not even NASA has managed to develop such a material. In reality, the outer edges of the mat often contribute less to load spread than the central region. That's why, when specifying mats, there always needs to be an engineering margin of redundancy. For example, if the allowable ground bearing pressure is five tonnes per square metre and the outrigger load is 15 tonnes, a simple calculation suggests a three square metre mat. But that ignores real world factors, so we always recommend stepping up to the next size - unless the values involved already include tangible factors of safety. You need that margin because you'll never achieve a full load spread across the mat surface.

A MORE INFORMED INDUSTRY

What's clear is that the industry is becoming more aware of these issues. Engineers, site managers, and crane operators are now challenging spurious claims and what some might refer to as marketing spin. They're asking harder questions about stiffness, material behaviour, and actual load distribution. And that's a good thing because outrigger load spread isn't one size fits all. Systems need to be selected and configured based on real engineering data and not assumptions.

We welcome those questions and make our material and section properties available and encourage clients' engineers to carry out their own due diligence. Because when the ground conditions, crane loads, and mat configurations are all properly understood, everyone works more safely.

The industry has taken a huge step forward, from guessing and generalising to understanding and engineering. The next step is choosing suppliers who are part of that evolution. If your mat supplier can't show you how they've calculated their safe working loads, or if their claims sound too good to be true, they probably are. When renting outrigger mats, know what's beneath your crane or platform and choose a system and supplier that treats load spread as engineering. ■

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