

Handleable Outrigger Mats - Technical Overview



Notes:

- The following slides are extracts from our certified CPD Presentation titled *“Good Practice When Specifying Outrigger Mats”*.



Outrigger Mats Material Selection & Certification

Material Selection & Certification



Key considerations:

- Weight / Density with regards Health & Safety (**Manual Handling**).
- Material properties and module section properties (**Structural Performance**).
- Weight and material properties of materials utilised in handleable outrigger mats are summarised within table below.

Properties	Nylanite	Plastic (UHMWPE)	Ekki / Azobé Timber (D70)	Oak Timber (D40)	ALIMATS® Aluminium (6005A)
Mat Density (kg/m ³)	1380	960	1080	660	600
Material Density (kg/m ³)	1380	960	1080	660	2700
Compressive Strength (Mpa)	123	21	34	26	280
Tensile Strength (MPa)	78	28	42	24	270
Modulus of Elasticity (MPa)	3000	1350	20000	13000	69000

- This table does highlight the varying material properties and why material properties at time of use should be known.

Material Selection & Certification



Extracts from industry guides and standards:

“Crane mats (timber, steel, HDPE, etc) are used to distribute the load of the crane to the ground. The suitability of the crane mat used is determined by:

- the size of the mat is suitable to distribute the load to the ground at a stress level less than the ground bearing capacity and
- the strength and integrity of the mat and its ability to handle the load exerted by the crane”.

[2] The Crane Industry Council of Australia – 2017

“The strength and stiffness of a pad will depend on the material and the thickness. Material strengths and stiffness are generally understood but it should be noted that plastics are stronger than timber but timber is stiffer than plastic, the order being as follows:

Strength: steel > Aluminium alloy > nylon > polyethylene > hard wood > soft wood

Stiffness: steel > Aluminium alloy > hard wood > soft wood > nylon > polyethylene”

[3] Ground Conditions for Construction Plant – October 2014

Material Selection & Certification

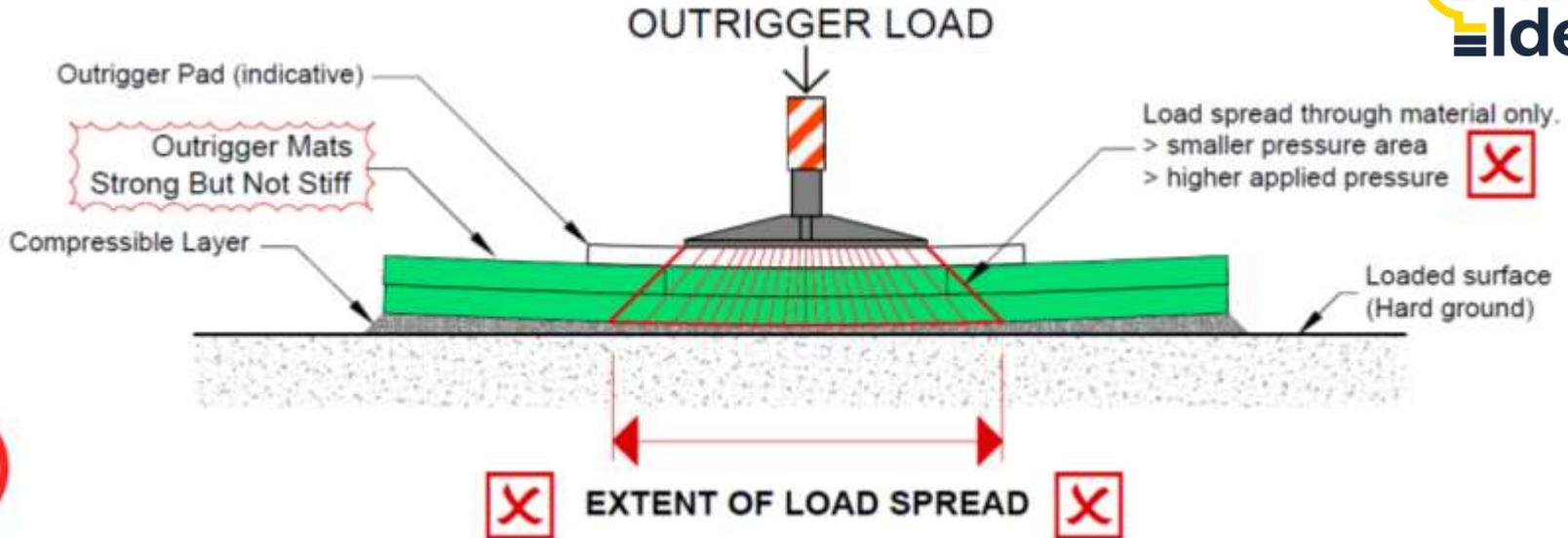
Outrigger mat material properties and function:

- For an outrigger mat to perform as intended the material used must be suitably stiff to distribute the outrigger load.
- Currently outrigger mats do not fall under the category of Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) and subsequently not regulated by the industry.
- Under LOLER lifting chains have to be certified and inspected every 6 months.
- Other outrigger mat manufacturers only promote high strength properties but not stiffness properties which is very misleading.
- Timber outrigger mats are the most widely used across the industry but strength properties of timber will deteriorate with age, when exposed to the elements and when subjected to repetitive use.

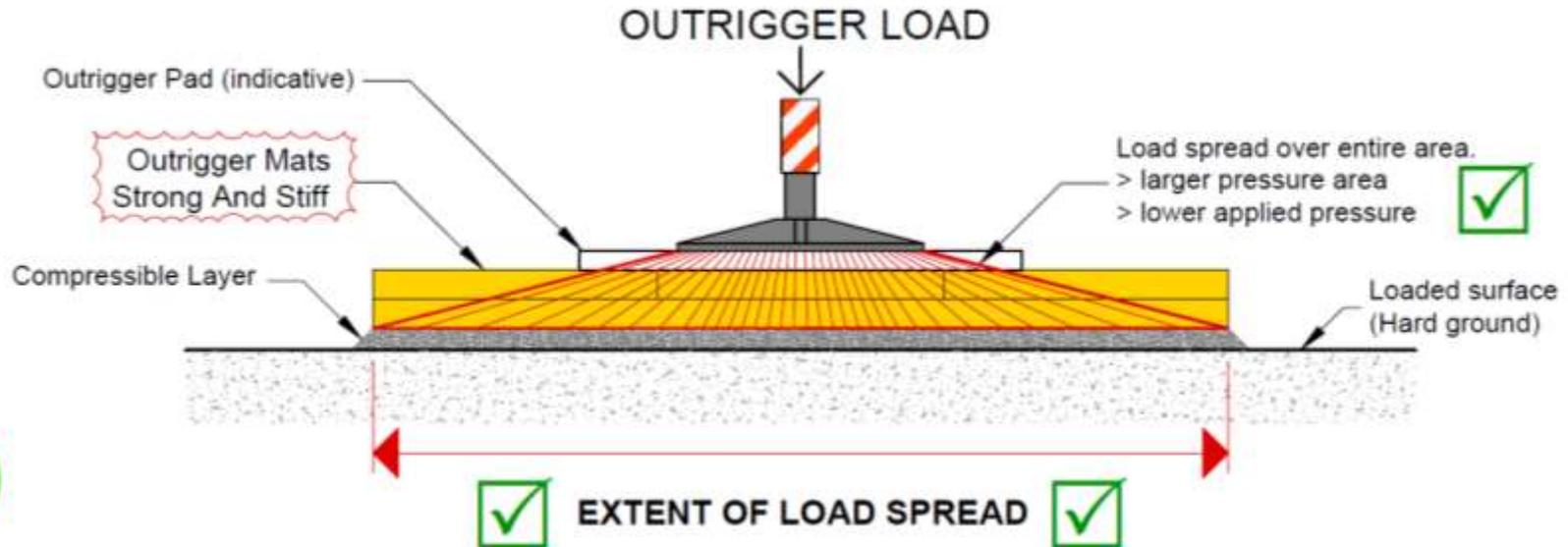


Photo of timber outrigger mats that were delivered to site with fungi attack clearly visible

Material Selection & Certification



Section Showing Outrigger Load Spread Through Strong Outrigger Mats That Are Not Stiff



Section Showing Outrigger Load Spread Through Strong and Stiff Outrigger Mats

Analysis / Testing and Outcomes

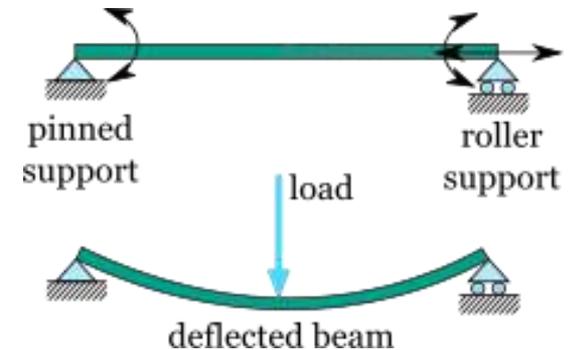


Finite Element Analysis (FEA) Study:

We have recently carried out various FEA studies on a variety of topics relating to how outrigger mats actually perform, we also looked at how other outrigger materials performed in comparison.

Key Topics:

- **Beam Analysis (Stiffness):** Analysis carried out to compare and understand different materials we carried out a simulation whereby the outrigger mat material was working as a simple beam spanning 1.5m with an applied point load of 10T (tonnes) at mid span.
- **ALIMATS® Patented Interlock (Structural Performance):** Analysis carried out comparing modules in both the interlocked and not interlocked position.

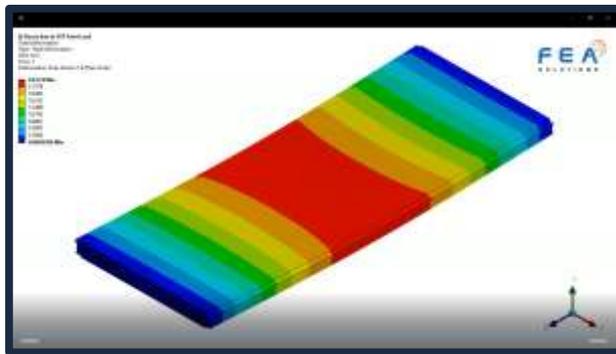


Analysis / Testing and Outcomes

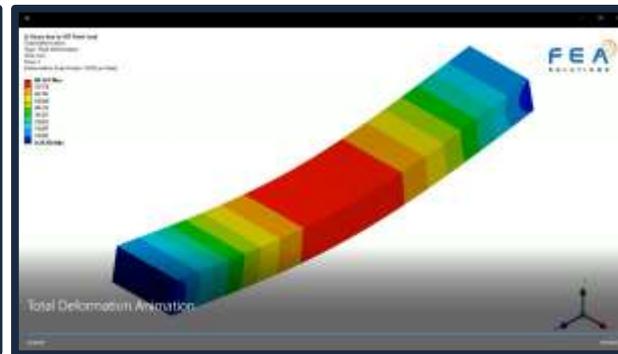
FEA Beam Analysis:

- Table below shows the bending results between each system.

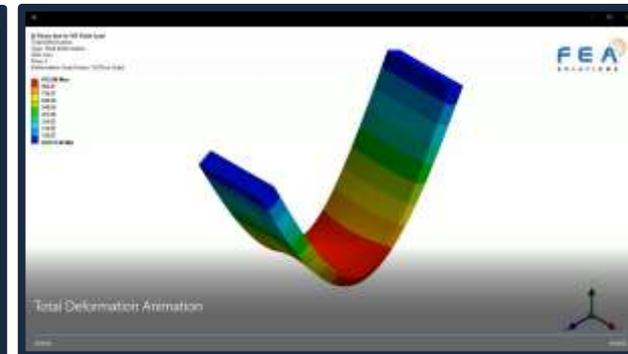
Material	Beam Span	Point Load	Max Deflection (Bending)
ALIMATS® (Aluminium)	1.5m	10T	24mm
Single Sleepers (Timber) D40 Oak	1.5m	10T	88mm
Ultra-High-Molecular-Weight Polyethylene Mats (Plastic) UHMW-PE	1.5m	10T	972mm



[Aluminium ALIMATS®]



[Timber D40 Oak]



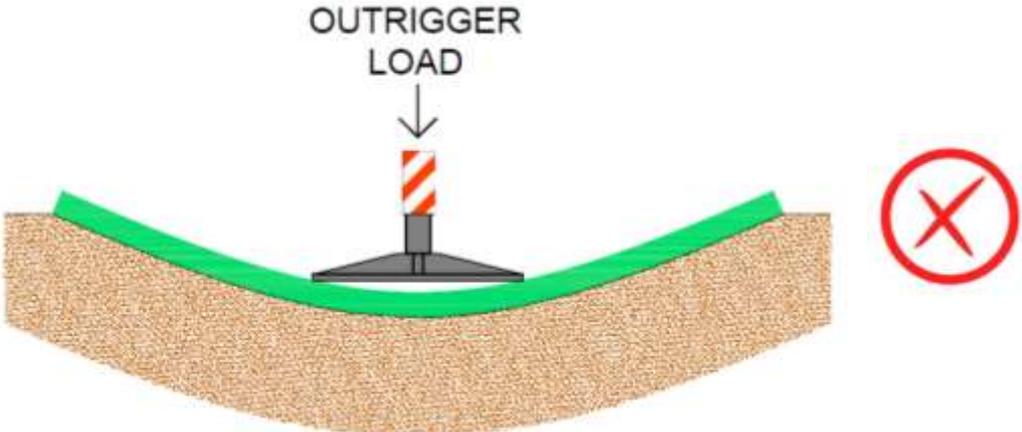
[Plastic - UHMWPE]

- The images above are the media simulations showing the extent of bending that occurred under load.
- Material stiffness (bending resistance) is key with regards to even distribution of load.
- Other systems only promote strength (compression) properties but not stiffness (bending).
- A pack of A4 paper is strong in compression but has very limited stiffness (bending).

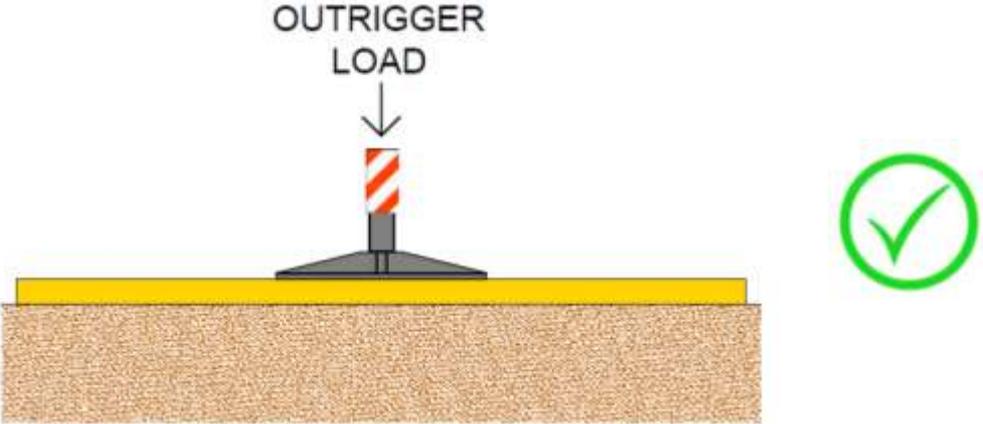
Analysis / Testing and Outcomes



Simply Explained:



Low Tensile Strength Outrigger Mats On Soft Ground



High Tensile Strength Outrigger Mats On Soft Ground



Analysis / Testing and Outcomes



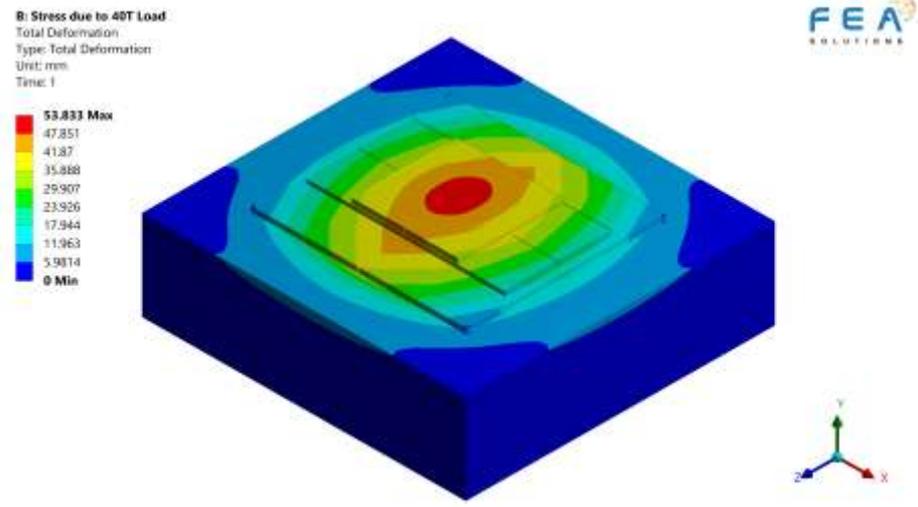
Interlocking System Compared to Non-Interlocking Systems:

One of the key features of ALIMATS® is that it comes with a patented interlock, this offers enhanced structural performance.

- The interlock enables monolithic action and enhances bi-directional load spread, which results in more even load distribution and reduced stress values below the mat surface.
- The interlock enables easier site placement / adjustment as the modules lock together.



Engaged patented interlock



Extract From FEA Report

Analysis / Testing and Outcomes

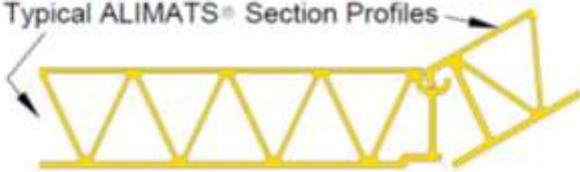


Interlocking Design Note:

IMPORTANT NOTICE - MODULE INTERLOCK:

Brilliant Ideas Ltd manufacture ALIMATS® from extruded Aluminium and the system has a fully patented interlocking design which enables monolithic action and bi-directional load spread. To ensure the system works as structurally intended the interlock must be engaged along the longitudinal joints.



INTERLOCK BEING ENGAGED DURING SITE SET-UP	<p>Typical ALIMATS® Section Profiles</p>  <p>Interlock Image</p> 
INTERLOCKED	 
NO INTERLOCK	 

Guidance on site placement refer to document: **Risk Assessment / Site Placement Guidelines**

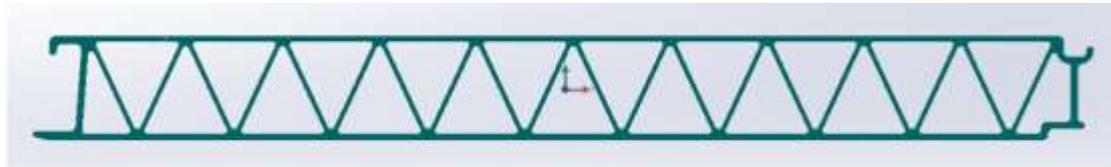
Outrigger Mats ALIMATS[®] System

ALIMATS® System



Product Description:

- ALIMATS® is a unique patented handleable interlocking outrigger mat system which is manufactured from recycled certified Aluminium.
- It has been specifically developed to spread outrigger loads and has been fully load tested.
- The image below indicates the lightweight truss profile:



3.02m² Configuration

Module Sizes:

ALIMATS® Module	Module Dimensions	Load Spread Area Based On Single Module	Module Weight	Code
Short	1160mm x 580mm x 60mm	0.67m ²	25kg	AM2
Standard	1740mm x 580mm x 60mm	1.00m ²	38kg	AM3
Long	2175mm x 580mm x 60mm	1.26m ²	48kg	AM4
Extra Long	3480mm x 290mm x 60mm	1.00m ²	48kg	AM5

Standard Core Mat Sizes:

- The various mat sizes / configurations are made up by interlocking modules together on-site.

ALIMATS® Outrigger Mat Plan Dimensions	Outrigger Mat Area	Drawing Reference
1.160m x 1.160m	1.346m ²	A-BIL-3M-134
1.740m x 1.160m	2.018m ²	A-BIL-4M-201
1.740m x 1.740m	3.028m ²	A-BIL-5M-302
2.320m x 1.740m	4.037m ²	A-BIL-6M-403
2.320m x 2.175m	5.046m ²	A-BIL-6M-504
3.480m x 1.740m	6.055m ²	A-BIL-12M-605
3.480m x 2.030m	7.064m ²	A-BIL-13M-706
3.480m x 2.320m	8.073m ²	A-BIL-14M-807

Site Set-Up

Manual Handling - ALIMATS®:

- ALIMATS® comes with handles fitted as standard which enables safe site placement and adjustment.

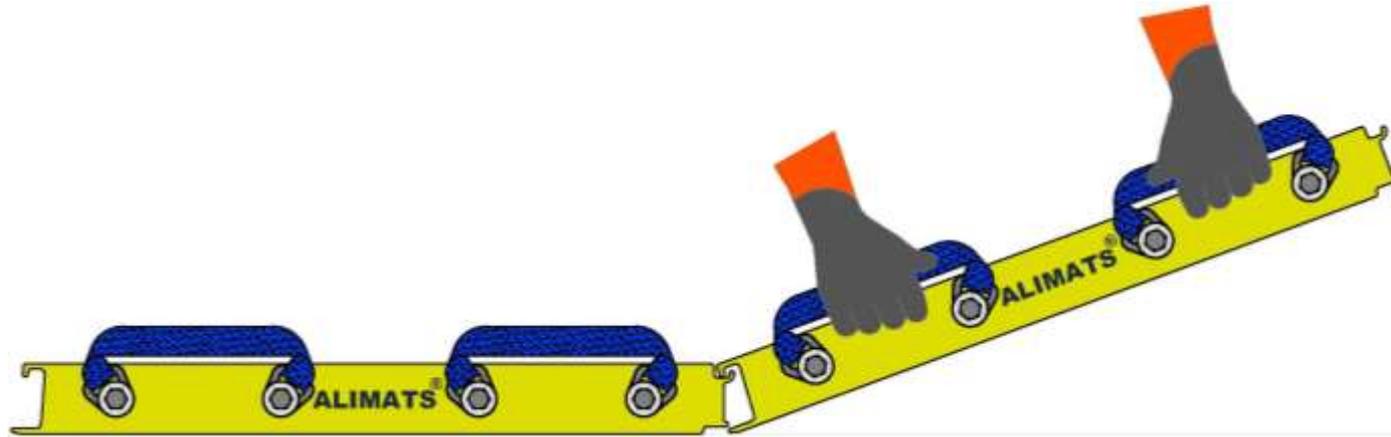


Image showing typical ALIMATS® profile with handles away from trapping zone

Site Set-Up - ALIMATS®



Unload from 3.5T van



Lower into required position



Engaged patented interlock



Repeat until configuration complete (6.05m² shown)

ALIMATS® System



Aerial Shot Showing ALIMATS® Under Crane Outriggers



3.02m² Configuration



5.04m² Configuration



6.05m² Configuration

Summary of Benefits:

- **CERTIFIED** - Mat modules manufactured from certified extruded Aluminium.
- **ENGINEERED** - Fully patented interlocking design enables monolithic action and enhances bi-directional load spread.
- **FLEXIBLE** - The various mat sizes / configurations are made up by interlocking modules together.
- **LIGHTWEIGHT** - Mat modules weigh between 25kg to 48kg which enable easy site handling.
- **MULTIPLE APPLICATIONS** - Suitable for Cranes / MEWPS / Concrete Pumps / Scaffolding.
- **SAFE** - No additional plant required and or short rigging to install / remove. Handles fitted as standard.
- **STRONG** - Non-destructive compression tested to 1005T/m² and FEA simulation to the point of distortion to 1856T/m².
- **SUSTAINABLE** - Manufactured from recycled Aluminium and can be transported to site in a small van.



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