LANDPAC

INTELLIGENT GROUND ENGINEERING SOLUTIONS

Ground Engineering Contractors delivering engineered impact compaction

Landpac Asia-Pacific specialises in providing and implementing ground treatment solutions on compressible unstable sub-grades through the use of impact compaction.

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Landpac Asia-Pacific part of the Conplant Group of Companies

Landpac Asia-Pacific's engineering resources offer superior impact compaction systems and expertise to the Construction Industry throughout the entire region.

Impact compaction

- Compacts In-situ Fills and Natural Soils to 5m depth
- Reduces sub-grade settlements
- Identifies Soft & Weak sub-grade areas

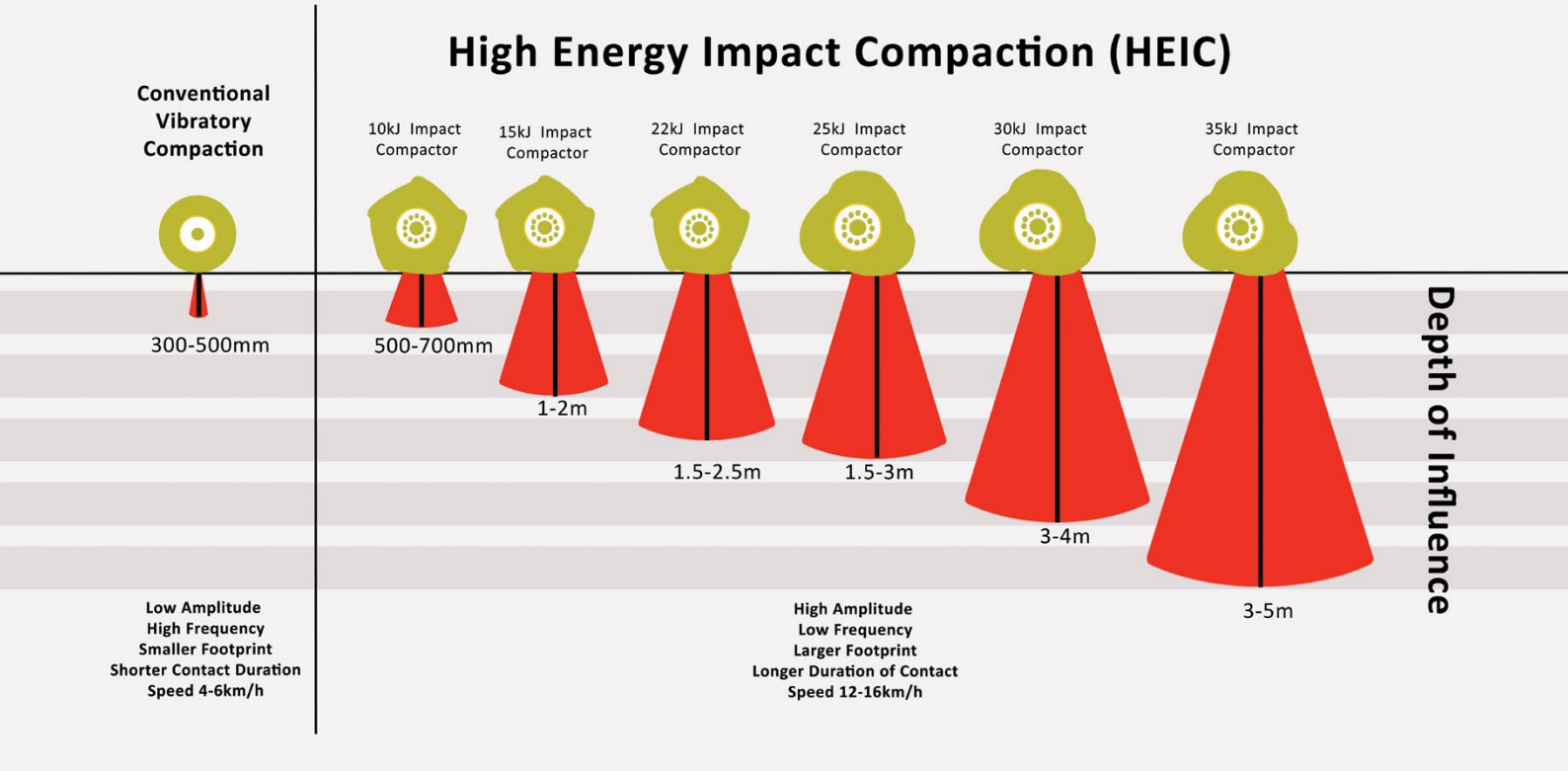
Impact compaction is a form of dynamic compaction which exerts high dynamic loads to in-situ soils with the rotation of non-circular Impact drums as the machine travels at approximately 16 km/h over the area being compacted.

The high dynamic loads enable deep compaction of in situ fills and weak natural soils resulting in significantly improved engineering soil properties.

The impact compaction depth achieved for a given soil profile is dependent principally on the magnitude of the soil stress induced by the impact drums. The induced soil stress is a function of the Impact Compactor Energy levels, which is related directly to the mass of the impact drum module weight, lift height and moment of inertia.

With Landpac's twin impact drum configuration the stress bulbs from each drum interact to create a wider and deeper zone of influence that with the High Compactor Energy enables compaction to greater depths.

Un-engineered fills are typically placed in an uncontrolled manner. Despite impact compaction's simplicity in compacting in-situ deep fills it requires careful control and monitoring of the compaction works for the reclassification of in-situ fill sub-grades.



Why engineered impact compaction?

- Reduced Risk
- Realistic Design Soil Parameters
- Total Quality Control

Engineered impact compaction involves the application of impact compaction in an “engineered” manner with extensive GPS and computer-based monitoring and control. This allows the identification of localised areas with higher settlement compression and/or deleterious material within structural stress zones.

Impact compaction applied in an “engineered’ manner using extensive settlement and soil response monitoring provides the certifying Geotechnical Engineer with a much higher level of confidence and allows the use of slab on ground construction and upper-level footings with realistic design parameters.

Landpac Asia-Pacific utilises innovative technologies including **Continuous Impact Response** (CIR) and **Continuous Induced Settlement** (CIS), combining impact compaction to provide **engineered impact compaction** on un-engineered fill sites. These technologies provide continuous data in three dimensions in plan, on the sub-grade stiffness and settlement.

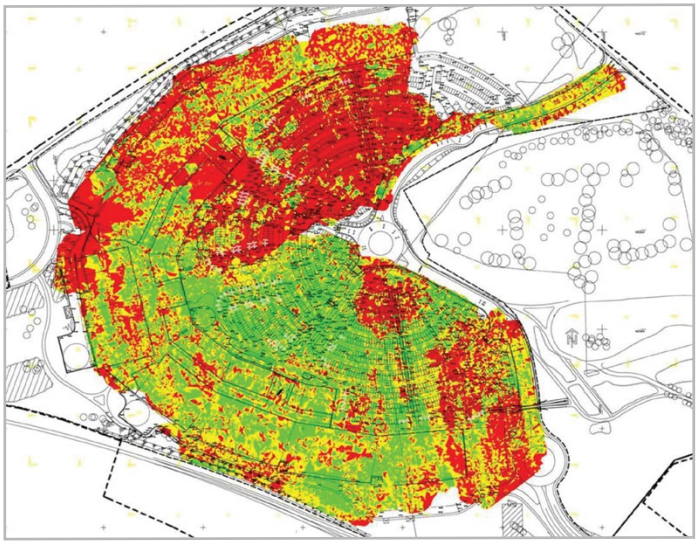
Continuous Impact Response (CIR)

- Identifies weak Sub-Surface Areas
- Characterises spatial sub-grade variation over 100% of area
- Records Compaction areas

The poor load-carrying properties of many un-engineered fills have been associated with their heterogeneity. The delineation of the sub-surface ground characteristics on un-engineered fill sites during geotechnical site investigations are often based on a limited number of test locations. The means of determining the soil parameters at these specific test locations are well established but are of little use without sufficient information of the spatial variation and heterogeneity of the site. With limited test locations on un-engineered fill sites the risk of unidentified areas with sub-surface deleterious material is high.

During compaction the impact compactor drums exert high dynamic loads on the sub-grade at regular intervals across the compaction area. The peak deceleration of the compactor drum is directly related to the resistance offered at contact resulting from the stiffness and shearing resistance of the material.

CIR technology measures the deceleration rates of the impact drum assembly and records the location co-ordinates with integrated GPS technology. The measured g-values indicate variations in sub-grade stiffness and identifies sub-surface weakness or deleterious material.



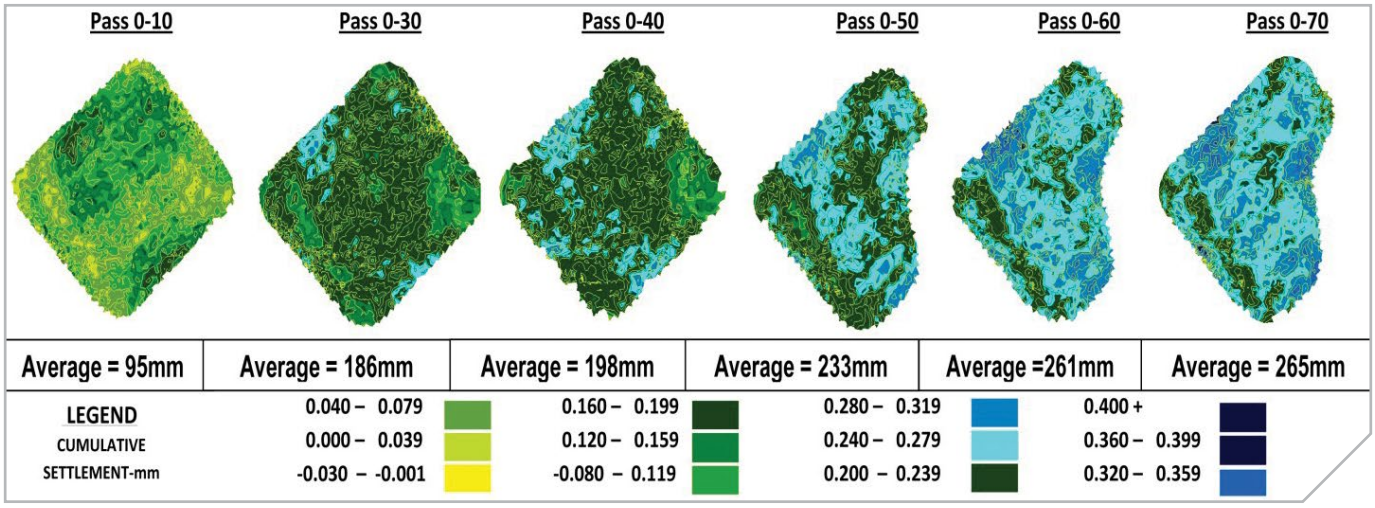
Continuous Induced Settlement (CIS)

- Measurement of whole area at 2m intervals
- Identifies local areas with high compressibility
- Documented Quality Control CIS Plots

With impact compaction the amount of compaction applied is usually controlled on site by measuring the compaction settlement between set numbers of passes. This was previously conducted “manually” using laser levels or total stations on a grid basis (say 10 x 10m). This method was time consuming and was not able to measure localized areas with higher compressibility that require additional compaction that may be outside of the grid locations.

Landpac’s CIS system is a differential GPS and “Diffsett” software tool that measures and records the surface levels at approximately 2m intervals and provides documented quality control of the works. Plots showing localised settlements are generated from the data.

The use of CIS is illustrated in the example below where impact compaction would have normally ceased based on the average settlements after 40 passes. CIS identified a localised area on the right-hand side of the plot which had been compacted to refusal at 40 passes. This area was excluded from further compaction. Significant compaction was recorded on the remaining areas from 40 to 60 passes. The CIS plot at 70 passes confirmed that the whole area had been compacted to refusal.



Uses and applications

- Residential Subdivisions
- Civil and Mining Infrastructure
- Industrial & Commercial
- Container Terminals
- Airports

Deep in-situ compaction

Proof rolling

Accelerated consolidation

Thick lift compaction

Compaction of rock fill

Rehabilitation of quarries and mines

Coal discard compaction

Treatment of unsurfaced roads

Treatment of dry materials

Permeability reduction

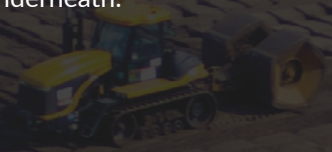
Land reclamation

Un-Engineered Fills: The use of CIR and CIS technology with the impact compaction of un-engineered fills provides reliable means for the engineering of un-engineered fills for the use of upper-level footings and slab-on-ground construction whilst lessening the need for the removal or partial removal and replacement of un-engineered fill materials.

Deep Loose Natural and Dredged sands: Deep impact compaction techniques developed by Landpac can, with the use of CIR and CIS technology, compact saturated and unsaturated very loose and loose sands to a dense and very dense state to 3 metre depth and to a medium density to 5 metre depth.

Saturated Weak Compressible Soils: Impact compaction, with the use of CIR technology, can be applied in a controlled manner to consolidate saturated weak compressible soil stratum of limited thickness to depths of approximately 5 metres.

Landfills: Old age landfills which are often used for recreational purposes can be treated with impact compaction to reduce creep settlement and maintenance costs. If adverse soil conditions are detected that could bring risk to people or the environment, HEIC allows compaction without the need to unearth or disturb what's underneath.



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