

Engineering Report: Concrete Pavement Requirements for Different Straddle Carriers

The following is a summary of the key findings of an engineering report by Consulting Civil Engineers (CCE), into the effects of using mini-straddle carriers on industrial pavements.

CCE compared mini-straddle carriers with 4-axles, 2-axles, and 1.5-axles (also called 3-wheelers) and looked at their effect on concrete slabs:

- The major concern to the pavement design is the axle load which generates the critical stress to the pavement.
- Based on literature review for industrial pavements, pavement thickness typically ranges from 150mm to 200mm.
- Standard pavement thickness is generally adequate for a 4-axle mini-straddle carrier, even with a 35t lifting load. This is because more axles mean a higher load distribution.
- However, it becomes inadequate for the 2-axle and the 1.5-axle carriers, even with a reduced load of 26t. The pavement will be damaged if the 1.5 or 2-axle carriers travel and operate on it.
- Cracking of the concrete will start from the bottom and may not immediately be visible.
- Once the damage becomes visible, fixing the pavement will involve major works, which is time consuming and costly. For example, after 3 years the damage to a 2,000 sqm area would cost approximately \$35,000 to repair and the new concrete requires 28 days to cure before it can be driven on.

Concrete Construction Costs for Greenfield Yard

The following table provides an estimate of the costs involved in catering to mini-straddle carrier concrete slab thickness requirements when cementing a new 2,000sqm yard:

Concrete Slab Thickness & Design	4-axle Straddle Carrier Design	2-axle Straddle Carrier Design	1.5 axle (three-wheeler) Straddle Carrier Design	Cost (2,000m ²)
165mm thick, single reinforcement	✓			\$157,000
215mm thick, single reinforcement		✓		\$198,000
250mm thick, double reinforcement			✓	\$233,000

Notes: The report used the Australian Codes or technical design guides such as C&CAA and Austroads for pavement structural design. The above values are estimates and depend on the quality of the concrete and the underlying surface. Please consult a Civil Engineer to assess your yard before deciding on the suitability of any container handler.

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