LEPPINGTON BUS DEPOT CASE STUDY

CLIENT: Interline Bus Services

CONTRACTOR: ACP Hardstand

DESIGN ENGINEER: Infratech

HYDRAULIC ENGINEER: RGH Consulting Group

MANUFACTURER: Austral Masonry
To accommodate continued population growth in Sydney, the NSW Government has initiated the South West Growth Area Development Plan. The development plan aims to help better connect new suburbs with upcoming major infrastructure projects such as Western Sydney Airport at Badgerys Creek and the Paramatta City redevelopment. Leppington is one of the first suburbs to be part of the South West Growth Area and will undergo a major facelift during stage 1 of the plan. As part of the development, public transportation services were upgraded. This increased demand caused Interline Bus Services to outgrow their old bus depot in Macquarie Fields, forcing Interline to store busses on council property for a daily fee. To avoid this additional cost, Interline Bus services commissioned the development of a new bus depot in Leppington NSW to accommodate an additional 40 busses for the next 10 years.

The project aimed to maximise land use of a 10,000 square metre site to store busses whilst meeting council development requirements, to limit stormwater runoff and to re-use runoff as grey water. To achieve a feasible result, Interline Bus Services had to get creative with their solutions.

Using DesignPave, designers were able to produce a solution meeting the project requirements utilising permeable interlocking concrete block pavement technology. The project consisted of:

- 2000 square metres of building facilities;
- 7000 square metres of impermeable concrete segmental pavement; and
- Two 500 square metre permeable concrete segmental paving pits.

All runoff from the 10,000 square metre sites was diverted into the two permeable paving pits.

Permeable pavements were used to allow designers to maximise the total pavement hardstand area for Interline. By using permeable pavements, designers were able to reduce site discharge below the council threshold of 88L/s for a 5 year design storm and 165L/s for a 100 year design storm. Additionally, the permeable pavement base acted as an underground detention basin, achieving the on-site storage capacity requirement of 200kL as specified by the council. This was achieved without constructing large, above ground water storage infrastructure.
Interlocking Pavement

The methods used to construct Leppington Bus Depot proved to be very efficient. The concrete segmental pavers were palletised and delivered in a pre-laid 1 square meter herringbone format, where 800-1200 square meters of pavers were machine laid each day. The entire 7000 square metre section of interlocking pavement only took 8 days to completely machine lay and was instantly trafficable after installation. “I have never seen a hardstand installed so quickly.” says Joe Oliveri, Managing Director of Interline Bus Services.

The use of concrete segmental pavers proved to be very cost-effective as well, saving 25% in cost compared to cast in-situ concrete. Not only does Leppington Bus Depot provide a large space to park and traffic buses, but it instantly eliminated the previous ongoing cost of leasing council land. As the concrete segmental pavers are pre-cured and quality assurance (QA) controlled this eliminated the need for curing compared to cast in-situ concrete, making the completed areas of the hardstand instantly trafficable. The interlocking concrete segmental pavement also offers great ongoing maintenance benefits compared to Interline’s previous asphalt yard.

“The managing director had owned bus depots in the past, which had asphalt and concrete hardstands, all of which had failed over time.” says Michael Koungras, engineering manager at Austral Masonry. “He was after a cost-effective functional hardstand that could be easily and effectively maintained.”

Permeable Pavement

To meet the Council’s requirement of stormwater storage and limit the outflow to the stormwater network, a permeable pavement area was implemented. This mechanism simultaneously meets Council requirements while reducing the need for stormwater infrastructure such as drainage pits and pipes, reducing costs and installation time. Using the DesignPave software, the design team was able to produce a permeable pavement area based on Leppington’s site conditions. The permeable pavement area was conservatively designed using the strength of fully saturated materials, 10-year infiltration values and a 30% void ratio in the DesignPave software package. This ensured that pavement performance was designed well beyond its initial design life.

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Renewable Materials

Leppington Bus Depot uses a variety of recycled materials. The base of the interlocking hardstand uses blast furnace slag, a by-product from the manufacturing of steel and a 100% waste material. Recycled sand was used as the bedding sand layer for the interlocking pavers. The paving units themselves are manufactured with a cementitious replacement in the form of fly ash, a by-product from the combustion of coal at power stations.

Sustainable Design

Most importantly, Leppington Bus Depot is a great example of a project that promotes sustainable design through various mechanisms. Stormwater that enters the permeable pavement system is recycled and used to wash down the buses daily, reducing the demand on the mains water. The geotextile used between the subgrade and base layer simultaneously increases the pavement’s performance while reducing the material thickness. This further reduces the need and cost of excavation and raw materials. The colours of the paving units were also specifically chosen to minimise the urban heat island effect.
Figure 1: Site Plan

Figure 2: Detailed Stormwater drainage plan
Watch the Leppington Time Lapse Video