Industrial Pavement Disputes - Green Fields and Grey Areas

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This article may be of interest to those involved in disputes relating to the performance and use of industrial pavements, both within buildings and externally. It may also be relevant for those involved in commercial property leasing.

Introduction

Even by the dry standards of building dispute topics, concrete pavements may provoke a jaw aching yawn. However, they are a fertile field for disputes which can be expected to increase for the reasons discussed in this article.

Traffic-able pavements are large elements of key infrastructure for the commercial sector and represent high capital value and often high opportunity cost when they deteriorate prematurely.

In commercial use, pavements have a finite lifespan and can readily deteriorate if over worked by heavy vehicles, high loads or environmental changes. The design of pavements is quite a complex process and is not always done appropriately. Standardisation of designs and the regulatory system are incomplete and disputes between tenants, property owners and builders over performance of pavements are not uncommon.

Industrial pavements may be grey and dull on the surface but are technically complex beneath.

Design

Virtually all heavy duty pavements are concrete as asphalts and gravels are insufficiently robust. The design process is quite complex and is governed by the environment and the use to which the pavement is intended. In most cases this reduces to the number of wheel loads and their magnitude over an anticipated service life. Anticipating future use is not always easy and the design engineer may not have accurate information upon which to base his design. Ideally engineering designs should state on the drawing their intended service loads, both in magnitude and repetition and the design service life. This is rarely done and is commonly an uncertainly faced in reviewing the suitability of a design.

A pavement design will typically consist of the following:
A foundation specification (this may be natural ground or fill). The subbase (usually a nominal thickness of crushed rock). A pavement specification including, thickness, concrete grade, reinforcing fabric, and cover. Jointing layout and details are also very important.

The performance of the pavement may also be effected by site drainage which is often part of the design. Of all the factors listed above, the pavement thickness and the jointing are typically the most important. Soundly designed industrial pavements are generally at least 200mm thick and have a joint layout on a grid of less than 10m with construction joints and saw cut joints separately detailed. There are numerous alternative systems such as post tensioned and jointless arrangements but this discussion is limited to conventional reinforced concrete pavements.

A engineered pavement design should be informed by a geotechnical report with suitable recommendations and consider a defined design load and service life Suitable site drainage must also be designed, this is usually on the same drawing. Unfortunately and particularly in cases of small projects, documentation is often poor.

A gap in the system at the design stage is that there is nothing to stop an engineer presenting an arbitrary specification without any analytical support, not even consideration of loads and this does occur. Unlike in structural engineering for building permit approved works, there is rarely any requirement for certification or BCA compliance. Whilst numerous codes and standards may be applicable there is no regulatory system requiring such compliance.

Forklifts commonly impart high wheel loads to pavements due to the cantilevered position of their loads.

Approvals

Unless buildings are part of the scope, a building permit may not be required. Thus design documents are not always filed for building permit. Even if a building permit is required there is no effective system in place to ensure that the design meets the intended usage. This is an important departure from standard building work in which the BCA and loading codes provide a framework to ensure buildings are able to serve their intended purpose. In every case I have investigated the approved documents have not adequately defined the intended service use or design life.

Inspections

There are no mandatory building surveyors' inspections for pavements unless they are part of a building. In the event that such inspections occur, the building surveyor may do little more than glance at the foundation and reinforcement. Typically, sub grade preparation, sub-base thickness and materials and many other factors including finished slab curing are important. Ideally multiple engineering inspections should be provided and their findings documented, but this rarely occurs. Thus for practical purposes most such works are not usefully inspected leaving little assurance that works were built as designed.

Why Does this Matter?

Unlike many parts of a building, the design life of such pavements is a real and practical limitation. There are no inherent safety factors and, typically, the design life will not be as long as for conventional buildings. Pavements are designed to wear out. To make them more robust then necessary is too costly. This is a reason why roads have to be periodically re-constructed. This is a method of achieving the most economical life cycle.

Usage

Again this is an area where little regulation or documentation is common. Particularly if the site has had multiple tenants the past use to which the pavements have been put may be unclear. Even the current use may not be well defined.

Failures

Typically failure starts with fretting at joints and accelerates as fretted material has a destructive effect. The practical ramifications of this may vary from little to severe, depending upon the state of deterioration and service requirements. The most sensitive situations are often within factories or warehouses. Many modern warehouses have high forklift operations for raking access. These machines must run on a sound and level base to safely operate at height. Spalled materials may cause other damage and OH&S issues.

Investigation

This typically starts with a walk over inspection and a review of jointing and any exposed edges. Further testing such as core hole investigation of the pavement and testing of the sub grade may be required. Although analysis is complex it is sometimes possible to reverse engineer from minimal information. For instance, it might be possible to establish that the constructed thickness as not suitable for the service loads over a range of other estimated variables. This kind of sensitivity analysis can sometimes save extensive testing.

Repair

Epoxy repair of cracks is often appropriate. Even though such repairs are often unsightly and unlikely to be durable they will typically slow fretting significantly and thus increase service life. Later more extensive works may be required. Beyond this, demolition and reconstruction is usually the ultimate solution and this may be staged to best contain the impact upon site usage. Other techniques with specific applications include grout injection to raise low areas and local patch repair.

Concrete cracks are notoriously difficult to repair. Careful consideration of responses may be required.

Tenancy & Leasing

Many commercial and industrial properties are leased and few leases are specific about the use to which pavements are put or the loads and repetitions they can sustain. Ideally the lease should be based upon design documents and construction records confirming the proposed use is within the capacity of the pavement and be accompanied with a detailed condition report. All this information may not be available but any kind of information about the agreed use of the pavement may be useful in the dispute context.

The lack of the above cautions lead to scenarios where usage causes expensive deterioration. Tenants suffer loss of amenity and costs to their business and owners are faced with expensive capital works. What has gone wrong? Has the tenant miss-used the pavement or was it at the end of its design life anyway? Should the property have been leased for the purposes to which it was put? Who is responsible for repair or re-construction?

The Technical Expert's Role

The technical expert will often focus upon what (if anything) has gone wrong and the alternatives available to make good. The briefing solicitor needs to carefully consider the questions to ask the expert in light of the lack of the regulatory frame work and available documentation. It may be useful to first engage a engineer for a global review rather than going straight to a more specific focus such as materials or geotechnical investigation.