JOINT FREE SLABS

As the name implies **joint free slabs** feature none of the shrinkage control joints that are typically found in traditional slabs on grade.

the concept

Joint free slabs use a plastic grid *(left)* to induce a closely spaced network of fine cracks throughout the entire length and breadth of large-area slabs on grade, and thereby eliminate all traditional formed and sawn shrinkage control joints.

The principal objective with **joint free slabs** is to dissipate the effects of drying shrinkage as uniformly as possible in the form of fine cracks throughout the entire area of the slab, and to produce only fine cracks that do not adversely affect applied finishes.

It stands to reason that the more cracks there are on a closely spaced regular grid, the finer they will be *(right)*.

The crack inducer grid used for **joint free slabs** in Australia is a one meter square grid, and a sufficient number of slabs have been completed to show that this is adequate to achieve the principal objective. The cracks produced by this grid are sufficiently fine to have no detrimental effect on applied finishes that are installed in accordance with the specification, and hence they do need to be treated or reflected through the finishes.

With **joint free slabs**, therefore, it is not only possible to save a lot of cost and time by the deleting of the control joints and their cover strips, but it is also possible to achieve a continuous appearance of the applied finishes.

Concrete specification

Concrete compressive strength should not be over specified, as not only does higher strength concrete cost more, it also has a higher drying shrinkage and this will increase the general crack width.

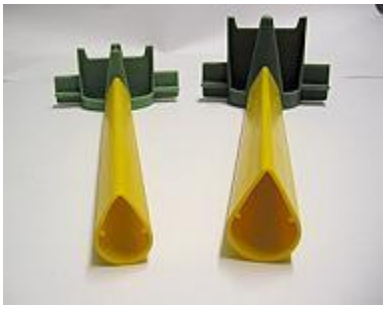
Within reason, everything possible should be done to achieve a low drying shrinkage. This starts with the specification and use of the best available raw materials, and it finishes with the adoption of best practice in the mixing, placing, compaction and curing.

Additives can also be used to assist with placing and finishing and these can have a positive effect in the reduction of drying shrinkage. It is essential to evaluate the benefit of any additives against the cost, as in some cases the effect is minimal and very difficult to justify.

The use of super plasticizers is recommended especially when very large areas are to be placed in a single pour, as they make the placing and finishing easier and they should have the added effect of reducing drying shrinkage.

It is extremely beneficial to the **joint free slabs** system to achieve high early shrinkage of the concrete. With high early shrinkage, the crack inducer grid gets a chance to "kick in" before the concrete attains significant tensile strength to resist cracking. Methods adopted to increase the early shrinkage should not however compromise the integrity or durability of the concrete.

the **joint free slab** crack inducer grid



The crack inducer grid used in Australia is a one meter square grid comprising extruded plastic tubes and plastic four-way junctions. The plastic tubes are supplied cut to length for the one meter square grid, and the grid is assembled on site with the tubes fitting snugly onto the junctions.

There are currently two different sizes of crack inducer grid, a 30mm high crack inducer for 90-110 thick slabs and a 38mm high crack inducer for 120-135 thick slabs. New sizes will be added to the range for thicker slabs when there is adequate ongoing demand.

The junctions double as bar chairs to provide support for the reinforcement mesh. The height of the junctions has been set to achieve a minimum 40mm cover in 100 and 125 thick slabs.

The original crack inducer tube was circular in cross section and a fair to high degree of random cracking occurred with this grid. The current crack inducer tube has a tear-drop shaped cross section and it is a far more effective crack inducer.

Reinforcement

Only a light mesh reinforcement is required with **joint free slabs**, and for most slabs F62 mesh is specified. This is sometimes increased in applications where finishes are not to be applied to the slab surface, and heavier mesh will generally be required for thicker slabs.

The full perimeter of each **joint free slab** pour is trimmed with 2N12 bars and special attention is paid to the trimming of re-entrant corners and penetrations.

Traditional bar chairs are generally only required around the perimeter of a slab and at penetrations. The one meter spacing of the grid junctions is generally adequate for the support of the broad area of the reinforcement mesh.

width of induced cracks

The objective with **joint free slabs** is to produce only fine cracks. When everything works as intended crack widths in the order of 0.3 to 0.5mm are achieved. However, not all crack inducers always kick in and therefore some cracks may be wider than this. Based on observations and experience to date it is

reasonable to expect cracks to be generally less than 1mm wide, and with the new profile crack inducer grid the maximum crack width should be closer to 0.5mm.

Maximum pour size

The maximum pour size is generally only limited by the ability of the concrete to place and finish the concrete and the availability of locally produced ready mixed concrete. Typically a single crew is provided to place and finish the concrete, and a comfortable pour size for a single crew is 1,000 to 2,000 square meters.

With proper planning pours can be programmed for a twenty four hour cycle, and in such circumstances pour sizes closer to 1,000 square meters seem to be preferred.

suitable applications for **joint free slabs**

joint free slabs are particularly suitable for applications that are to have finishes such as vinyl or ceramic tiles applied. Such applications include supermarkets, retail centers, schools, hospitals, sports halls and large residential projects (see Project List). It is with these slabs that the savings in construction cost and construction time is maximized.

The list of suitable applications has grown with the introduction of the current crack inducer tube cross section. With this crack inducer the outcome is far more predictable.

A fair to high degree of random cracking often occurred with the original crack inducer tube profile and although the result was more than satisfactory for floors with applied finishes, it was considered by some to be less than satisfactory for slabs with no applied finishes.

It must be appreciated that the acceptability of the finished appearance is a very subjective issue, especially in circumstances where there are to be no applied finishes. It is recommended that clients be made fully aware of the anticipated outcome before they commit to using the system. The potential benefits of faster construction time, lower construction cost, lower maintenance cost, superior termite resistance and superior aesthetics of applied finishes will normally weigh heavily into the decision process.

potential savings in construction cost

The direct savings in construction cost can be substantial. They are maximized when slabs are to have finishes such as vinyl or ceramic tiles applied, and they emanate from all or some of the following:

- No bedding sand required - typically 50mm of sand bedding is provided and there is a cost associated with the removal of the sub-base and the supply and installation of the sand
- Use of a thinner vapor barrier is encouraged
- All formed and sawn control joints are deleted
- All compressible isolation material is deleted
- Thinner slabs are possible in many cases due mainly to the simplicity of detailing
- The mesh reinforcement is generally lighter with **joint free slabs**
- Skilled labor is not required to install the grid
- Once the crack inducer grid is placed, placing of reinforcement is greatly simplified as very few traditional bar chairs are required
- A further simplification in the fixing of reinforcement is that the cutting-in required at traditional control joints is not required as there are no control joints
- Concrete pump hire costs are minimized as the pour sizes are generally much greater than with traditional slabs on grade
- Sealants are not generally required as there are no control joints
- Temporary filling of control joints for the casting of tilt-up panels is not required, and the joint free slab provides a superior casting surface
- The installation of applied finishes such as vinyl and ceramic tiles is simpler as there is no cutting in to control joints. If not at first, this will ultimately reflect in the price
- All cover strips and fillers normally required in the applied finishes at control joints are deleted - this results in a substantial saving

In Australia the savings vary from job to job and from builder to builder. However, typically they are estimated to be in the range AU$20 to AU$50 per square meter for retail floors. The savings are significantly less for slabs with no applied finishes, however there is a growing popularity in the use of **joint free slabs** for basement car parks where the significant benefit is reduced construction time.

potential savings in construction time

The savings in construction time are equally as impressive as the savings in construction cost:

- Each of the items that produce a direct saving in construction cost also produces a saving in construction time. The savings in time quickly accumulate.
- Builders that use the system advise that a time savings in the order of one week per thousand square meters is possible in retail developments where there are applied finishes.

- Builders are now electing to use **joint free slabs** for undercroft car parks primarily to save time on critical path. They form up off the car park slab for the suspended retail floor over, or they use it as a casting bed for tilt-up panels.

Potential savings in maintenance cost

Joint Free Slabs Pty Ltd has been advised by a representative of the largest supermarket chain in Australia that they spend more each year on the maintenance of control joints than any other item in their stores. Deletion of the joints and all associated cover strips and flexible fillers eliminates this expenditure.

Control joints in industrial floors are usually the first, and often the only, region of failure. They fail under the impact action of solid wheeled fork trucks and pallet movers, and for a variety of other reasons. Once the suitability of **joint free slabs** for industrial floors is established beyond question, the potential savings in maintenance expenditure will be huge.

industry recognition

The joint free slab system is now well established in Australia, and it has been used in a wide variety of projects since mid-2000.

Within just twelve months of its launch, **joint free slabs** received industry recognition in the form of an excellence certificate awarded by the *Concrete Institute of Australia* at its biennial conference in Perth in September 2001.

By October 2003 almost 100,000 square meters of **joint free slabs** had been placed in Australia and the system is being repetitively used in projects for large national retailers such as *Woolworths*, *Coles*, *Bi-Lo* and *Officeworks*.