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The Practice of Cutting Reinforcing at Sawcuts

A comment by Andrew Dallas, Technical Manager, Conslab Ltd

A sawcut in a concrete slab is where the engineer is inducing a crack to form in the slab. The aim being to reduce the build up of drying shrinkage stress such that a random crack does not form. Random cracks look unsightly and as such clients consider them to be a structural failure of a floor. This is not the case, a sawcut joint is simply more aesthetic than a random crack through being straight with clean edges. A sawcut also has a significant advantage in that where a crack or a sawcut might start to be damaged by the use on the floor it is easy to seal a sawcut to reduce the risk of edge damage

In a completely unreinforced slab these cracks will open up enough such that there is no load carrying capacity across the crack. If the crack opens more than 1mm then the sides of the crack cannot lock on each other and there is loss of load capacity. Each panel then works like an individual paving stone.

Secondary mesh is not in the slab to provide structural strength. The mesh is there to hold cracks tight such that the rough surface of the crack locking with the other side of the crack (known as aggregate interlock) provides vertical load carrying capacity.

It is the amount of steel across that crack and the stress it is under that determines how wide the crack opens. The aim is for the reinforcing to keep the crack opening to less than 1mm. The less the opening the greater the load carrying capacity.

In fact the depth of the sawcut, typically 1/4 to 1/3rd the depth of the slab, actually reduces the ability to transfer the vertical loads through reducing the depth of aggregate interlock. Structurally sawcuts are actually slightly weaker than a random crack.

The mesh in the slab is sized such that it can withstand the tension built up in the slab through drying shrinkage over the distance between free movement joints. If this distance is too great or the mesh area too small then the steel will yield and the crack under the sawcut will open up to form a wide joint, known as a dominant joint. A successful design is where the concrete cracks at the sawcuts and the mesh holds the cracks tight to allow aggregate interlock to work.

However this is where often find the engineer specifying that we should remove half of the steel at the exact point where we are inducing a crack to form. The rational of course for cutting out every second bar is to ensure the crack occurs at the sawcut. However a quick look at the difference in elasticity between concrete and reinforcing steel shows that the concrete is taking the vast bulk of the load until it breaks and transfers the load to the reinforcing. The key to ensuring the cracking occurs at sawcuts is getting the sawcut in before any temperature induced movement and making the cut of adequate depth.

If the specification is followed then it is most likely a dominant joint will form mid way between free joints over the year or so following construction. This dominant joint reduces the overall capacity of the slab as you now have a free edge with no load support. This is

difficult to remediate and requires either a cam lock or inserting stitch bars, expensive and messy.

Note:
Conslab construct a large number of high performance slabs of all types, post tensioned, steel fibre and conventional reinforcing. We are also deeply involved in repairing and maintaining existing slabs for clients throughout New Zealand. It is based on this experience that we offer our knowledge to help improve overall construction practice.