

Diamond Dowel and Viper Dowel Systems

DIAMOND DOWEL FOR SLABS ON GROUND VIPER DOWEL FOR SUSPENDED SLABS AND STEEL FIBRE JOINTLESS SURFACE BEDS

- Provides superior load transfer across the joint compared to traditional round dowels.
- Allows 2 way horizontal movement of the floor slab.
- Does not allow vertical movement.
- Eliminates problems of dowel misalignment.
- Spreads stress over the full width of the dowel.
- Allows sub base preparation right up to the slab edge.
- Eliminates requirement to drill holes in timber forms for dowel bars.
- Easy form stripping.

Traditional round dowels for slabs on ground have been the most common method for providing load transfer across floor slab joints, most engineers appreciate that using round dowels allows shrinkage contraction in only one direction. Round dowels do not allow any lateral movement of the slab, resulting in the slab "locking" and cracking across the corner.

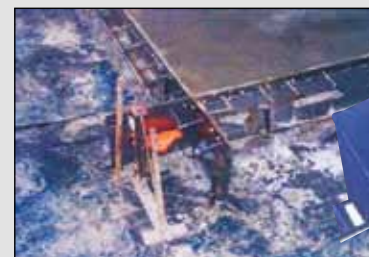
Unless the dowel bars are installed parallel and straightened prior to the adjacent pour, the slabs will be locked together by the dowel bars. Traditional dowels can also be bent by vehicles driving over the bars and in themselves pose a trip hazard.

USING DIAMOND DOWEL

- As the Diamond Dowel is installed just prior to concreting the second slab there are no dowels protruding to become bent or damaged.
- The contractors can make sure the sub-base is properly levelled and compacted right up to the slab edge because there are no dowels protruding.
- The introduction of the Diamond Dowel follows research carried out for the American Concrete Institute publication on Floor Slab Construction.
- The Diamond Dowel investigation included the development of the extensive computer programmes to analyse the Diamond Dowel as a finite plate element on an elastic foundation.
- Analysis demonstrates that the stress from the Diamond Dowel reduces significantly beyond the first 25mm of the dowel past the joint as can be seen in figure 2. It also can be seen in this diagram that only a small portion of the plate has the maximum stress.
- Using the analysis and values obtained the sizes and spacing of Diamond Dowels were developed. The maximum peak stress and deflection values were used conservatively.



**Diamond Dowel
for slabs on the Ground**



**Viper Dowel
for suspended slabs**

Steel fibre joint less, heavy duty thick ground slabs

The Diamond Dowel has significant reserve strength because the plate can re-distribute the stress if local yielding occurs. The Diamond Dowel is the optimum shape for a dowel. It is wide where the bearing, shear and flexural stresses are the highest and is narrow where the stresses are reduced. Importantly the Diamond Dowel also allows the slab to move horizontally and laterally without restraint as the slab joint moves open.

ADVANTAGES ARE THEREFORE

- Diamond Dowel can be fixed to the formwork without the requirement for drilling holes through the formwork, allowing the slab to move unrestrained horizontally and laterally which will help reduce or eliminate the potential for restraint cracks.
- A Diamond Dowel is a more efficient use of material and more cost effective than traditional round dowels. It is wide where the bearing, shear and flexural stresses are highest and is narrow where the stresses are reduced.
- Traditional round dowels have to be installed with the first slab pour leaving the bar sticking out which, besides being a safety hazard to operatives, can end up being bent by site traffic. The Diamond Dowel does not need to be installed until the second side of the slab is poured.

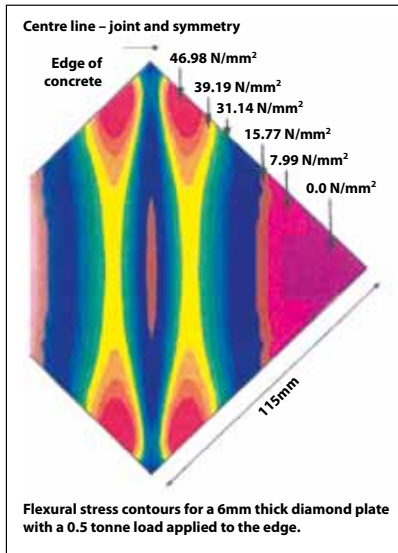
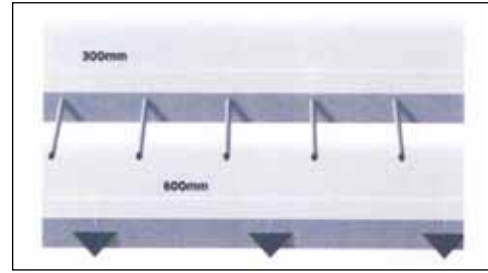


Fig 2



Above is a typical example of the Diamond Dowel spacing to match round dowel performance. A 6mm (1/4") thick x 115mm (4.5") square Diamond Dowel @ 600mm centres will provide the same performance as 16mm round dowels @ 300mm centres. The table below provides the typical spacing for the Diamond Dowel compared to 16mm, 20mm and 25mm round dowels.

Round Dowel Size	16mm		20mm		25mm	
Round Dowel Spacing	300mm	450mm	300mm	450mm	300mm	450mm
Diamond Dowel Spacing (6mm x 115mm)	600mm	750mm	450mm	600mm	300mm	450mm

Joint deflection between adjacent bays of floor slabs causes joint aris breakdown. Testing of dowel systems compared 20mm square dowels with Diamond Dowels at 10mm joint opening and a maximum vertical deflection of 1.25mm. The table below shows the comparison.

Dowel Type	Dowel size (mm)	Length (mm)	Dowel Spacing (mm)	Slab thickness (mm)	Concrete Strength (MPa)	Load @ 125mm joint displacement (kN)
Diamond Dowel	6	110	450 c/c	150mm	28.5	58.1
Square Dowel	20	400	450 c/c	150mm	26.5	39.1

INSTALLATION IS SIMPLE

- A** **A, B AND C** Nail the Diamond Dowel to the formwork at desired locations.
- B** **C**
- D** **D** After casting the concrete, remove the formwork.
- E** **E** Insert the Diamond Dowel plate just prior to casting the abutting slab.
- F** **F** Diamond Dowel leaves the slab or edge strip free from protruding Dowel Bars and allows the sub-base to be placed and levelled right up to the concrete face.
- G** **G** No more drilling and removing timber forms over dowel bars.

VIPER DOWEL

For installation on timber forms or supplied with Viper Joint for use on reinforced suspended slabs, steel fibre jointless or heavily loaded thick ground bearing slabs.

The calculated load transfer capability for a single 10mm thick Viper trapezoidal plate dowel excluding the concrete, assuming a 20mm joint opening, is reproduced below comparing the capacity with a single 6mm Diamond Dowel, 20mm round dowel and a 20m x 20mm square Dowel.

Dowel Type	Ultimate load (kN)		
	Bending	Shear	Bearing
20mm Dia Round Dowel x 600mm Long	38.12	46.6	42.21
20mm x 20mm Square Dowel x 600mm Long	55.0	59.4	42.21
10mm Trapezoidal Plate x 250mm x 200mm x 120mm	151.93	318.2	123.4