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# Concrete Advice

## Exposed

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BGC Concrete's Architectural Range of exposed mixes will add value to your building project.

The success of using this range of mixes depends upon planning and attention to detail, an experienced contractor should always be appointed to achieve the best results. The contractor should be aware of the limits and details of the mix supplied, correct ordering and placement of concrete in addition to expert finishing skills are required to ensure that a consistent presentable job is achieved. Remember the trade skills employed are as important as the mix being supplied, don't cut corners. The process is not just good luck on the day!

To assist your selection process all mixes are coded, no names, just codes. It is imperative that you quote the correct code, it will have the appearance of EX2514A122, the detail identifies the type of mix, in this case exposed, its strength, aggregate size and type and the cement colour. Without the code we are unable to supply. BGC Concrete personnel are available to provide expert advice once you have made your mix selection.

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### Accelerators / Retarders

Precautions need to be taken when pouring in hot weather and to a lesser extent at cold temperatures. The concrete suppliers aim is to design mixes which allow the concrete to remain 'plastic' for the same time period, whether in summer or winter. To do this the supplier uses accelerators and retarders. Firstly accelerators, the only real issue here is that you have enough manpower to place and finish the concrete. Secondly retarders, they present problems that need to be understood, yes you will be able to place the concrete however as the surface dries out the main body of the concrete will remain plastic. This leads to surface cracking unless it is managed, referred to as plastic shrinkage cracking. The stresses which occur through concrete shrinkage are greater than the speed the concrete is gaining strength, the stresses cannot be overridden by strength gain. Moisture loss at the surface is a problem, shade, wind breaks will help, the use of aliphatic alcohol sprayed on the surface will also prevent moisture loss, this needs to happen until the body of the concrete is set and the concrete can be finished. If moisture is lost at the surface and finishing commences too early the concrete will appear to be spongy, the body of the concrete is still reaching initial set, the surface has set. Once finished the concrete must be cured (refer separate section).

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### Acid Washing

Generally completed several days following placement, essentially used to 'clean' aggregates in the mix prior to sealing. This process should be completed by a qualified applicator.

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### Area

Don't ask the contractor to do too much, its easy to pour initially however chasing the concrete to achieve the desired level of exposure if you are not using surface retarders can often lead to an inconsistent appearance.

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### Curing

Curing benefits all characteristics of concrete, it lessens moisture loss, improving the hydration process, the concrete will shrink less, have higher strength, improved durability and long term performance. Curing is often overlooked by contractors, it is perhaps the most important aspect of concrete placement particularly in hot environments, strengths can be compromised by up to 20%.

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### Don't Forget

Sewer access, conduits, reticulation sleeves and termite should all be provided for before you pour. The perimeter of the residence should be sprayed as per the requirements of the Part B Termite Treatment AS3660.1 2014 (Termite Management Part I : New Building Work), alternatively a reticulation system can be installed to those areas abutting brickwork to allow future termite treatments. Sewer access points can be fitted with covers, spare conduits or sleeves installed to allow access under the pavement for reticulation, landscape lighting etc. Concrete finishers are not form workers, for specific details ie: stairs, door track block outs, light canisters, drains etc it is worthwhile employing a form worker to install these items, this will ensure that they maintain a 'true' line enhancing the finish of the job.

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### Expansion

Exposed aggregates abutting brick work should always have expansion foam separating the two materials. This allows for expansion, the two materials can move independently, the concrete does not stick to the brickwork which may result in cracking.

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### Flat Slab/Thickness

Whether 75 or 100mm in thickness, it needs to be CONSISTENT, the prepared surface should be level, if not the thinner areas may crack, often at some point in the future. All pipes to soak wells, reticulation sleeves and conduits etc should be within the sand pad, not concrete, as a weakness leading to cracking will result.

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### Joints

Plan the joint layout before starting, if the contractor is not tooling joints on the day of the pour, cutting of the joints MUST take place early the next day, don't DELAY, cracks will appear at re-entrant corners and narrow sections without fail!

It is worth noting that all concrete shrinks, whilst the Australian Standard 1379 states 1000 microstrain as an upper limit for N Class concrete, that's 10mm in 10m, local aggregates produce lower shrinkage levels. Shrinkage is measured over a 56 day period however the majority of shrinkage will occur within the first few days. Joints must be placed early, especially in hot and dry conditions.

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### Ordering

Codes must be quoted when ordering. If you have poured on site previously, please let the plant staff know, this allows BGC to check our records and ensure that the code being quoted and concrete supplied are correct. Always order sufficient concrete to complete the job, plus loads are to be avoided as the time to batch (remember these are custom loads requiring the plant to individually batch, they are not produced automatically through the batch plant) and deliver (plus loads), particularly in the hot summer months may result in a cold joint. Not all batch plants produce exposed/polished mixes the plus load issue is exacerbated by the distance to site. Further, it is difficult to batch small quantities, ie: 0.2m<sup>3</sup> to achieve an accurate match, it is better to divide the job quantity into equally sized loads whenever possible for a consistent finish. As you can see planning and ordering are two key elements in achieving a successful job.

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## Pumping

As exposed mixes contain a higher percentage of coarse aggregates difficulties can be experienced when pumping, especially when long lengths of rubber hose are being used. We highly recommend the use of Viscosity Modifiers in the concrete which will improve pumpability, these products are a MUST if white sand is being used. It is important that the correct cement is used as a slurry, ie: for white concrete a use white cement. If you are pouring two mixes on the same day it is imperative that the pump is fully washed out, including the pump hopper before the new mix is introduced to avoid contamination.

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## Reinforcement

If mesh is being used ensure that the correct cover is achieved, you don't want to see mesh being exposed in the washing operation. On driveways (trafficable areas) particular attention should be given to the crossover 'wings', cracking often occurs at this location when driven over, it is recommended that re-entrant bars are installed at these locations, or double mesh. Remember the tensile strength of concrete is approximately one tenth of the compressive strength, a 2.5Mpa tensile strength will crack easily under load especially if poured on uncompact ground with little reinforcement.

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## Screeding

The Contractor needs to take extra care to ensure that the surface has a consistent appearance when exposed. If finished uniformly this will be achieved, the slab should be vibrated (refer separate section). Screed marks can occur when the screed is pushed into the concrete surface resulting in lines in the exposed slab, similarly feet marks can sometimes be seen in a slab, the contractor must fill feet marks with a uniform mix on stepping backwards out of the concrete. The identified issues are likely to be exacerbated if pouring at a high slump, rectification through additional exposing or sand blasting may be necessary.

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## Sealers

There are various options for sealing, sealers are available in matt and gloss type finishes, they may be water or solvent based, please refer to supplier or contractor to confirm your selection.

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## Seeding

Expensive aggregates can be hand seeded, be aware this is a subjective issue, supervise the contractor, or seed the slab yourself to the desired level. Make sure you have enough aggregate to seed the slab before you start pouring, divide the aggregate into portions and place it at locations around the slab to ensure that each area is covered and that you don't run out. Seeded aggregates should be soaked 1 hour before using. Always comply with the safety regime on site, wear PPE as required and ensure scaffold is in place on all elevated work areas and above all ask the builders permission to access the site, you will, most likely be accompanied.

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## Site

On sloping sites it is even more important that a surface retarder is used, its better to apply several even coats to avoid rivulets of chemical running down the surface, this can result in those areas being over exposed if too much is applied in one pass of the spray. Ensure that an area is prepared to act as a reservoir for the washed concrete run off, if there is a garage at the bottom of the a driveway, pour the garage later, this will allow the water to collect in the sand under the garage and avoid costly clean up operations. You will probably need a pump to pour the garage later, protect the exposed aggregate driveway, do not allow heavy vehicles to drive on newly laid exposed areas.

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## Slump

It is important that all loads are poured at a consistent slump, this will translate into a uniform appearance. If exposed concrete is poured at an excessive slump the following problems can result. Water = shrinkage, even though joints are cut the next day there will be a greater risk of the concrete cracking outside of the joint pattern. Aggregate segregation or settlement, if the slump is excessive the aggregate can 'sink', the surface retarder may not penetrate deep enough to exposed the aggregate to the intended level, it is likely to give a patchy appearance requiring remedial work to address ie: sand blasting. For an even appearance all loads must be poured at the same slump, a large variance will be noted in the level of exposure on site, be especially careful with small loads, if you do run out of concrete and require an additional 1.0m<sup>3</sup> plus load, tell the plant when ordering to batch it dry(60 slump), you can always add a small amount of water on site to match the previous load, if its delivered too wet then a different appearance of the plus load will be apparent.

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## Stairs

Fully vibrate, they are difficult to patch, especially the risers take extra care, don't rush.

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## Surface Retarders

Consistency is everything, the use of a surface retarder which allows the concrete to be exposed on the following day is recommended. Same day washing is reliant upon the skills of the contractor, it can be affected by differential setting times of the concrete, ambient temperatures, areas of shade etc basically the concrete has to be consistently hard to ensure an even level of exposure is achieved, if too soft the concrete can be overexposed in places which will result in an entirely different appearance of the finished surface. BGC Concrete recommend the use of surface retarders, they take the risk out of exposed concrete and achieve a more consistent appearance if applied to manufacturers recommendations. Importantly there are surface retarders for all applications, vertical and horizontal, winter and summer and varied concentrations to produce levels of exposure from 2mm to 7mm suiting the required level of exposure and the aggregate size being used. It is recommended that BGC's 7mm exposed aggregate mixes use a maximum 3mm surface retarder.

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## Vibrator Use

Vibrators will provide better compaction, removing voids. Their use should be consistent throughout the pour. The vibrator should enter the concrete surface vertically and in a set pattern to ensure the whole area is covered. Do not drag vibrators horizontally through the concrete surface, it will leave trails in the concrete, void of aggregate resulting in an inconsistent finish.

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## Water

Make sure that you have an adequate water supply and pressure to wash the concrete, if using a surface retarder a pressure washer will be used to expose the surface on the next day. Protect brickwork, woodwork, windows, plants, fences etc inevitably there will be a certain amount of clean up required, this can be managed with correct precautions being taken prior to the washing process.