

## Recommendations for Architectural & Colored Concrete

**The following recommendations are for architectural concrete with slumps of 110 to 130mm.**

- For large or critical projects, expectations should be established through meetings with all relevant parties in attendance.
- Conduct test trials or mock-ups to establish the required finish with the customer and to provide the site crew with an opportunity to establish their procedures. Ensure customer is aware that minor variations in appearance are an acceptable and normal feature of concrete, due to a number of reasons, including differences in water contents, forming, finishing, curing methods, and weather conditions.
- Use the same mix for all exposed architectural work in order to achieve a consistent appearance. One slump should be established for a given project.
- A minimum of 350 kg/m<sup>3</sup> (max. water/cementitious ratio of 0.45) cementitious material is required in the mix.
- Schedule for consistent mixing times between subsequent loads. Avoid pours during high wind, hot sun exposure, rain, snow, or frost.
- Set increments of volume may be required to maintain consistency of coloured concrete.
- A 3m<sup>3</sup> minimum truck load is required to maintain accurate batching.
- No calcium chloride to be used. Use non-chlorine accelerators only.
- CSA notes small lift thicknesses. It is recommended that placement of lifts be a maximum of 1 m.
- Use only clean, high quality, high density materials, such as steel or high density overlaid plywood with plastic form liners. Lumber forms can affect colour of surface, unless treated with a non-porous coating.
- Ensure joints are tight and sealed to avoid leakage.
- Use only one type of form oil applied evenly and in very thin applications. Ensure form oil is non-staining and allow for air bubbles to escape.
- Pumps and lines should be primed with a mortar mix of equal strength and colour.
- Minimum coverage to be 50mm over reinforcing steel from edge of wall.
- Don't move concrete with vibrators. Place concrete as near to the final location that is practicable and use shovels to move concrete.
- Insert vibrator quickly into concrete, penetrating into previous layer, and slowly lift up. A maximum vibrator lift rate of one foot per second, with lateral vibration spacing at a maximum of 18 inches is recommended. Use a minimum of a 50 mm diameter high cycle vibrator.
- Have the same person operating the vibrator on all architectural concrete – good placement and vibration technique will reduce bug holes and help eliminate the need for patching.

- Some applications may require re-vibration 15 to 20 minutes after placement to obtain a proper finish.
- Forms should remain in place for 48 hours.
- The addition of polypropylene microfibers to all flatwork can reduce plastic shrinkage cracking.
- Concrete must contain joints to reduce unsightly cracking. Concrete panels in approximately rectangular shape should be used (square panels are ideal). Use a ratio of 1.5:1 or less to reduce potential of cracking down the center of the panel. Avoid sharp corners, re-entrant corners, or inclusions whenever possible. Make sure the subgrade is well compacted when re-entrant corners are present and utilize contraction joints where cracking is most likely to occur.
- Effective joint spacing:
  - Exterior walls - No more than 6 m apart (with frequent openings)  
- No more than 7.5 m apart (with fewer openings)
  - Slabs on ground – Generally 24 to 30 times slab thickness
- In addition to joints, vertical surfaces may contain tie holes or reveals to improve appearance. Form ties help maintain separation between formwork faces.
- Surface joints between panels should be filled with a non-staining, colour matched joint sealant.
- Textured surfaces reduce the appearance of imperfections and produce more uniform results than smooth surfaces.
- Sandblasting exposed concrete should be done by one individual and system to maintain consistency. Allow a minimum of three weeks curing prior to sandblasting.
- Note that repeated trowelling (burnishing) to create a smooth, dense, hard surface tends to darken the colour of the concrete. Testing is recommended first to ensure the final burnished surface matches customers' expectations.
- Ensure suitable and consistent curing conditions are met. Uneven curing can produce uneven colour and finish. For coloured concrete, use only curing compounds recommended for coloured concrete. Maintain concrete temperature between 18°C and 29°C during the first few days after placement (for most applications).
- If required, fill bug holes and other defects within a few days after form removal. This will reduce the possibility of colour variations as the concrete ages. Determine patch mix proportion by testing first. Mortar used in patching typically has a lower water cement ratio than the concrete, and tends to dry darker in colour.
- Other available finishes include broomed, exposed aggregate, mechanically abraded, salt pocked, stamped, form liners, and formed surfaces.

For more information, please consult the following:

- ACI 301 - Specification for Structural Concrete for Buildings.
- ACI 302.1 - Guide for Concrete Floor and Slab Construction.
- ACI 303 - Guide to Cast-In-Place Architectural Concrete Practice.
- ACI 305 - Hot Weather Concreting.
- ACI 306 - Cold Weather Concreting.
- ACI 306.1 - Specification for Cold Weather Concreting.
- ACI 325.9 - Guide for Construction of Concrete Pavements and Bases.
- ACI 347 - Guide to Formwork for Concrete.