

# THE SPECIFICATION of Burnished Concrete Finish



Burnished finish with clear sealer

## 1 DEFINITION AND SCOPE

Burnishing is the term applied to the finishing of concrete to provide a hard-wearing, durable finish with a surface lustre. It has been used for many years in industrial buildings, car parks and warehouses, but is now increasingly also being used in residential and commercial buildings. The application may incorporate integral or broadcast surface dry shake colourants, colouring dyes and/or staining.

This data sheet provides a description of the process and suggested specification clauses for burnished concrete surfaces, primarily for flatwork applications. Some clauses will need to be varied to meet specific project requirements. The text in square brackets – eg [product and supplier] – must be replaced by appropriate words or values relevant to the particular project.

## 2 DESCRIPTION

### 2.1 Steel Trowel Burnishing

This method involves the extended mechanical or hand trowelling of the concrete surface at the time of placement until a finish having a surface lustre is obtained. The concrete strength should typically be at least 32 MPa to ensure sufficient fine material is available to achieve a good surface finish. Stringent control of slump, compaction, finishing techniques and curing are needed to ensure a consistent high-quality finish. More often than not, more stringent tolerances on flatness and levelness will also be required as the reflective nature of these surfaces will tend to highlight even minor variations in flatness and surface finish. Specification of such tolerances and subsequent measurement is detailed in the CCAA Data Sheet [Tolerances for Concrete Surfaces](#).



**BURNISHING** is the term applied to the finishing of concrete to provide a hard-wearing, durable finish with a surface lustre

The steel trowel burnishing process typically requires a concrete slump of 80 to 100 mm. While a maximum tolerance on slump of  $\pm 15$  to  $\pm 20$  mm is allowable, the concrete should be as consistent as possible to limit the variation in finishing times between the concrete batches. The desired outcome of burnishing is to achieve a smooth, impervious and durable surface, free of residual trowel marks. By the nature of the process, burnishing results in densification, and therefore darkening, of the surface from the extended trowelling. The extended trowelling for large areas is best achieved by the use of several power trowelling machines which may be single-, dual- or triple-head devices. Hand burnished floors on the other hand require either an increased number of workers, or the floor being split up into sections of a manageable area.

## 2.2 Wax or Resin Burnishing

Floor waxes, liquid polishes and resin-based coating applications can also be used to produce a burnished finish. These are multi-layer applications which, after the recommended curing period, are burnished or polished using polishing equipment. The degree of lustre achieved is dependent on the quality of the concrete surface finish (particularly the surface density), the quality of the particular coating product and the burnishing technique.

## 2.4 Toppings

Burnishing by either method may also be used for topping slabs and thin toppings applied over existing floors.



Burnished finish using coloured concrete and clear sealer

## 3 SUGGESTED SPECIFICATION CLAUSES

### 3.1 Test Panels

3.1.1 The construction of test panels under full site conditions shall be completed at least 28 days prior to the commencement of placing to allow assessment and acceptance of the finish.

*Commentary:* Note that non-critical areas of the actual work may be used as test panels to reduce costs. If this is the case, the areas that can be used should be specified.

3.1.2 Each test panel shall be constructed to reflect all facets of the element's design and construction, including the intended method of formwork construction, subbase preparation, reinforcement detailing, concrete placement, and finishing techniques.

3.1.3 Each test panel shall be subjected to the minimum curing requirements specified or appropriate for the intended application.

3.1.4 Test panel sizes shall be a minimum of [specify dimensions] in size.

*Commentary:* The size of test panels should be selected to ensure that it is possible to incorporate all the features of the finish that need to be assessed. Sizes may range from 1000 mm x 1000 mm to a maximum of 2400 mm x 2400 mm. If small honing equipment is being used, 1000 mm x 1000 mm may be satisfactory. If large machines are to be used on the final work, or the appearance of patterns and joint details need to be assessed, then the required size would be near the upper limit. The size may also be governed by specific tests to be carried out on the surface.

3.1.5 The following tests shall be carried out on the test panel [specify tests and result to be achieved].

*Commentary:* Tests may include a slip resistance test appropriate for the application in accordance with AS/NZS 4586 Slip resistance classification of new pedestrian surface materials or an abrasion resistance test if this is a critical factor.

3.1.6 The nomination and acceptance of the approved test panel shall be the responsibility of [state person responsible].

*Commentary:* Usually the principal's representative would be nominated.

3.1.7 If test panels do not meet expectations of colour, surface finish or other required criteria, adjustments shall be made to the mix design and/or the placing/finishing techniques and a new series of test panels shall be constructed.

*Commentary:* The specification may include the number of test panels to be allowed for by the contractor.

- 3.1.8 Following acceptance of a test panel and agreement on an allowable deviation range, the panel shall be cut into [specify 500 mm x 500 mm or 600 mm x 600 mm] 'tiles' to facilitate secure storage and transportation for site comparison.

*Commentary:* An allowable deviation range for items such as colour may be based on the protocols given in AS 3610 or a range may be established for various aspects of the finish from a number of test panels. Note that this clause may not be required depending on the type of finish to be assessed.

### 3.2 Concrete Supply

- 3.2.1 Concrete shall comply with the requirements of AS 1379.
- 3.2.2 The concrete for the project shall be [specify N32 or S32 – specify supplier and product name if required] having a maximum nominal aggregate size of [specify 10, 14 or 20 mm] and shall be placed by means of [specify chute, pump, kibble].

*Commentary:* Normal class or 'N32' is suitable for most applications where colour is not critical. Where colour is specified, a special class or 'S32' will need to be specified and information provided giving details of colour (see 3.2.3) or other special attributes of the concrete. A 'C' suffix is added to the S32 designation if colour control is required. It should be specified only if consistent colour is required over larger areas that are placed from more than one batch of concrete. The minimum strength of 32 MPa ensures sufficient paste in the mix for satisfactory burnishing of the surface. A higher strength of 40 MPa is commonly specified where the burnishing is by steel trowelling. Generally a 20-mm aggregate would be specified. Smaller aggregates may be required for topping slabs depending on the topping thickness and whether reinforcement is present.

- 3.2.3 If coloured concrete is required, specify either (a), (b) or (c):
- (a) The concrete shall incorporate [specify colour of cement] from [specify producer],
  - (b) The concrete shall incorporate [specify pigment product and supplier] pigment at a dosage rate of [quantity %],
  - (c) The concrete shall incorporate [specify colour of cement] from [specify producer]

and [specify pigment product and supplier] pigment at a dosage rate of [quantity %].

*Commentary:* (a) If colour is achieved through cement colour, specify the type of cement to be used (eg off-white, white, grey) and supplier. The availability of colours should be checked prior to specification. (b) Normally it is sufficient to nominate a particular manufacture's colour without specifying a dosage rate. The responsibility for producing the colour with the specified concrete mix then rests with the concrete supplier. For colours outside the standard range, a dosage rate for the specific concrete mix may need to be established via test panels. (c) Often a particular cement colour is combined with pigments to produce the required colour, eg off-white cement and white titanium dioxide pigment.

- 3.2.4 The concrete shall be delivered to site with a nominated slump of [specify value].

*Commentary:* 80–100 mm slump is suitable for most flatwork applications. However, 100 mm is recommended as it is a more workable mix and reduces the temptation for excess water to be added on site. The lower end of the range should be specified only where good control over the placing and compaction processes is available.

### 3.3 Concrete Transportation, Placing and Finishing

- 3.3.1 Concrete shall be transported from batching plant to site as rapidly as possible by means of agitator trucks and discharged promptly to ensure proper placement and compaction.
- 3.3.2 Concrete that can not be placed and compacted within 90 minutes of batching, shall be used in the work only by agreement between the concrete supplier and [specify person]
- 3.3.3 No excess mixing water shall be added to the concrete on-site, without the written approval of [specify person].

*Commentary:* Usually the principal's representative would be nominated.

*Commentary:* The addition of excess water will affect the concrete properties. Note that the supplier may carry out final water addition on site but this is not water in excess of that designed for the mix, and responsibility for the concrete remains with the supplier.

- 3.3.4 The concrete shall be placed into position by means of [specify method – chute, pump, kibble] and shall not be allowed to fall vertically more than 2.0 m to avoid material segregation.
- 3.3.5 The formwork shall be filled to the intended level and concrete shall be screeded to the required level without inducing hollows, depressions or screed lines. Any hollows and depressions shall be filled with concrete and not slurry. Concrete used to fill hollows and depressions shall be worked into the surface and re-screeded to ensure a monolithic mass.
- 3.3.6 Concrete shall be adequately compacted. To ensure the expulsion of entrapped air, bond to reinforcement and to avoid the incidence of plastic cracking and surface imperfections, compaction shall be by one of the following methods:
- For slabs up to 100 mm in thickness, the placing, screeding and finishing operations shall be deemed to provide adequate compaction.
  - For slabs up to 200 mm in thickness, immersion vibrators or vibrating screeds shall be used. If vibrating screeds are used, the area adjacent to any edges shall be vibrated with immersion vibrators.
  - For slabs exceeding 200 mm in thickness immersion vibrators shall be used.
- 3.3.7 Concrete shall not be moved using mechanical vibration equipment and immersion vibrators shall not be dragged over reinforcement.
- 3.3.8 Compaction of concrete shall be carried out in a systematic manner to ensure uniform compaction.
- 3.3.9 No surface bleedwater shall be worked into the concrete surface. Finishing shall commence only when the bleedwater has dissipated. Surface bleedwater may be removed using a poly tubing dragged over the surface.
- 3.3.10 Following bleedwater dissipation, the concrete surface shall be adequately densified by either manual or mechanical steel trowelling to minimise imperfections and to increase abrasion resistance.
- 3.3.11 Kneeling boards and the use of floats as supports during finishing shall not be used. Planking shall be provided over the slab for this purpose.
- 3.3.12 Finished concrete surfaces shall have a maximum deviation from a 3-m straightedge placed anywhere on the surface of [specify value].
- Commentary: For typical residential applications a value of 12 mm would be appropriate and readily achievable. Due to the reflective nature of burnished surfaces, a more stringent tolerance (eg 3 to 6 mm) may be desirable and specified; this should however be discussed with the contractor to ensure that it is achievable. Further information can be found in CCAA Data Sheet Tolerances for Concrete Surfaces.*
- 3.4 Surface Burnishing** (include the appropriate clauses)
- 3.4.1 Steel trowel burnishing**
- 3.4.1.1 Burnishing the concrete by steel trowelling shall be achieved by repeatedly working the surface of the concrete using either a hand trowel or mechanical trowelling machine until a lustre is produced on the surface of the concrete.
- Commentary: Repeated trowelling as the concrete gains stiffness will also compact the surface, ensure maximum durability, impermeability and abrasion resistance.*
- 3.4.1.2 The trowelling shall be undertaken with consistent pressure. Each trowelling shall be at 90° to the previous pass to eliminate the development of hollows, ridges and depressions.
- 3.4.1.3 As the surface concrete consolidates with working, the angle of the trowel or trowelling blades shall be increased to intensify pressure and further densify the surface layer of the concrete.
- Commentary: Over-working any area should be avoided as this will result in isolated surface darkening or 'burn' marks, and conversely, under-working of the surface will result in isolated areas of a lighter shade. Once the concrete surface hardens to the point where further working of the surface is impossible, the steel trowel will chatter, resulting in ridges forming where surface material resists further consolidation.*
- 3.4.1.4 'Wet-wiping' or addition of water to the surface of the concrete during finishing shall not be permitted.
- Commentary: 'Wet-wiping' may result in surface dusting, crazing, loss of abrasion resistance and a permeable surface matrix.*

### 3.4.2 Wax or resin burnishing

3.4.2.1 Where wax or resin is to be applied and burnished, the surface of the concrete shall be steel trowelled to provide [specify minimal trowel marks, a surface free of trowel marks or other requirements], yet not over-worked to such an extent as to result in an inconsistent surface colour.

*Commentary:* Typically a finish 'free of trowelling marks' would be specified for concrete surfaces required to have a lustre of its own or high gloss finish.

3.4.2.2 Where resin or other chemical sealer products are used, they shall be applied to the surface and finished in accordance with the manufacturer's recommendations.

3.4.2.3 Where natural wax products are used, the surface shall be suitably prepared and the product applied and finished in accordance with the manufacturer's recommendations.

### 3.5 Concrete Curing

3.5.1 Concrete shall be cured for a minimum of [specify period] by keeping the concrete surface [specify method – continuously wet, covered in clear or lightly coloured plastic, or by applying a suitable liquid membrane-forming curing compound in accordance with AS 3799].

*Commentary:* For burnished finishes, while a minimum period of 14 days should be specified, longer periods (up to 28 days) are recommended to minimise the risk of cracking. For wax or resin burnishing, either avoid the use of curing compounds or ensure they are compatible with the product to be applied.

3.5.2 Curing shall commence as soon as possible, but no later than 3 hours after finishing operations have been completed.

*Commentary:* Covering with plastic and spraying with a liquid membrane-forming curing compound should commence immediately after finishing. Wet curing methods may require additional time to allow further hardening of the surface to avoid damage. Depending on the weather conditions, some form of interim protection

may need to be specified to avoid potential cracking problems if a wet curing method is specified.

3.5.3 If the specified curing method presents construction problems, an alternative solution shall be proposed by the contractor for approved by [specify person].

*Commentary:* Usually the principal's representative.

### 3.6 Sealing

3.6.1 Where specified (and after curing), the surface shall be sealed with [specify product and manufacturer].

*Commentary:* With the variety of sealing products available, the specific product to suit the application and finish required should be discussed with the manufacturer and details entered into the clause. Generally, only penetrating type sealers should be used for external applications: refer CCAA Data Sheet Slip Resistance of Polished Concrete Surfaces, Nov 2006.

3.6.2 The sealer shall be applied and cured in accordance with the manufacturer's recommendations.

3.6.3 A surface maintenance and cleaning schedule shall be established in consultation with the sealer manufacturer and the installer.