

THE SPECIFICATION of Honed or Polished Concrete Finishes



1 DESCRIPTION AND SCOPE

Honing gives concrete a smooth matt finish by grinding the concrete surface and exposing the aggregates. Smoother (polished) concrete surfaces can be achieved through extended honing using progressively finer abrasives (finer grinding grit heads/pads) to impart a lustre to the concrete surface. Surface sealants may be applied to enhance the surface lustre.

This Data Sheet provides suggested clauses for inclusion in specifications for honed concrete surfaces. They are written with flatwork in mind, although other concrete surfaces can be honed.

Some clauses will need to be varied for particular projects. The text in square brackets – eg [product and supplier] – must be replaced by appropriate words or values relevant to the particular project.



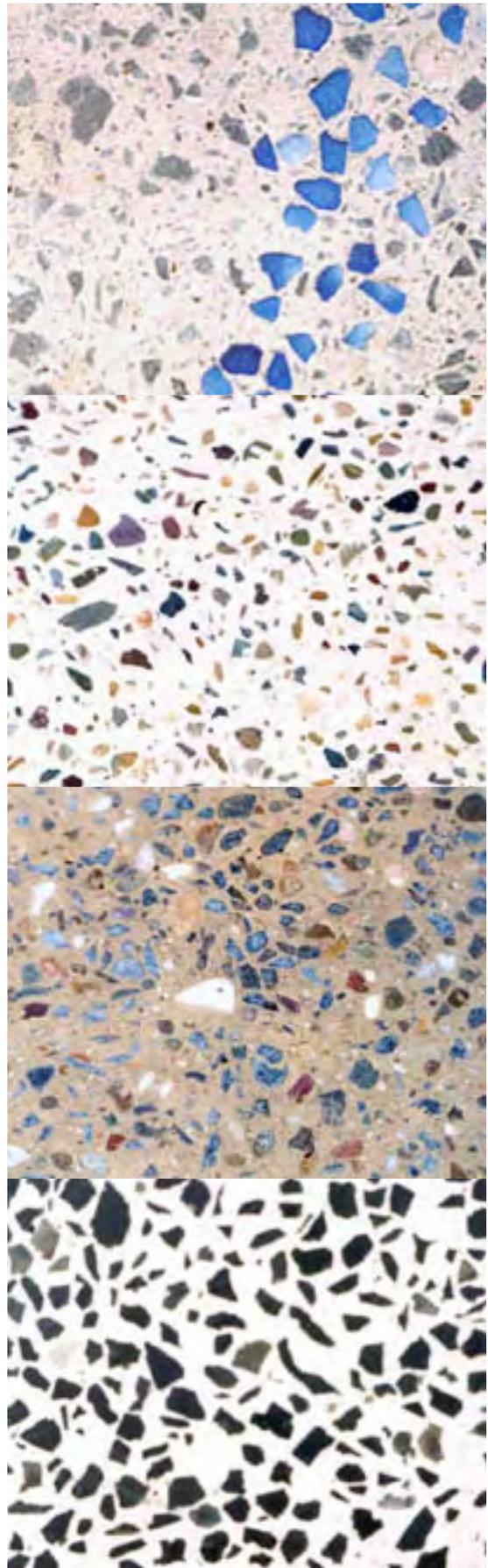
HONING gives concrete a smooth matt finish by grinding the concrete surface and exposing the aggregates

2 INTRODUCTION

Honing of an insitu concrete surface is achieved by grinding it with abrasives to give a smooth, low-maintenance finish with good durability characteristics. The term 'honed finish' is used to cover a level of grinding that produces a smooth but matt surface. Further grinding with progressively finer abrasives is needed to produce a 'polished finish' having a surface lustre.

The factors which affect the final appearance include:

- The colour and hardness of the coarse aggregate exposed by the grinding. While both the aggregates and the concrete matrix contribute to the final appearance, it is the aggregate rather than the matrix which holds the polish. Hard igneous rocks are the most suitable for honed (and polished) finishes as they resist wear and therefore tend to hold the smooth finish.
- The colour of the concrete matrix. The matrix is typically matched in colour with the coarse aggregate. This is achieved through cement colour and/or the addition of pigments (oxides). Since the coarse aggregate contributes significantly to the surface colour, oxide dosage rates of only 1–2% by mass of cement are typical, compared with 3–8% for ordinary coloured concrete (ie concrete in which the coarse aggregate is not to be exposed).
- The quality of the concrete. Regardless of what properties may be required for structural reasons, a high-strength concrete is desirable for the honing process. High early strength is particularly desirable to ensure good aggregate bond during honing. A minimum concrete grade of S32 (to AS 1379) is recommended.
- The fineness of abrasives. As indicated earlier, the fineness of abrasives used for honing, ie the number of stages in the honing process, will determine the smoothness and lustre (shininess) of the finished surface.
- The depth of honing. The depth of honing will determine the extent to which coarse aggregate is exposed. A light honing of the surface will typically expose the fine aggregates (sand) within the concrete mix and possibly the tops of coarse aggregate particles. Progressively deeper honing will expose more of the coarse aggregates. For maximum exposure of the coarse aggregates, the depth of honing should be approximately half the maximum nominal size of the coarse aggregates. Where large aggregate particles are required in the finish, it may be more economical to seed the surface with an aggregate having a flatter shape, or to cast in flat pieces of stone to reduce the extent of honing required.



With so many variables, it is most desirable for samples or test panels to be specified. The specification document should fully cover this aspect so that the means of achieving the desired finish is established before any final work is undertaken on site. Note that it may be possible to treat some inconspicuous or non-critical parts of the actual job as test panels.

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, aggregate distribution 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 an S32C [specify supplier, product name, if required] and shall be placed by means of [specify chute, pump, kibble].
- Commentary: The prefix 'S' signifies that it is a special class concrete and the information in brackets provides details of the 'special' attributes of the mix. The suffix 'C' signifies that colour control is required (which in itself requires the mix to be designated as a 'Special' class concrete). It should be added only when consistent colour is required over larger areas that are placed from more than one batch of concrete.*
- 3.2.3 If coloured concrete is required, specify either (a), (b) or (c):
- (a) The concrete shall incorporate [specify pigment product and supplier] pigment at a dosage rate of [quantity %],
- (b) The concrete shall incorporate [specify colour of cement] from [specify producer],

- (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) 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 thus rests with the supplier. For colours outside the standard range, a dosage rate for the specific concrete mix may need to be established from test panels. (b) 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. (c) A particular cement colour is often combined with pigments to produce the required colour, eg off-white cement and white titanium dioxide pigment.

- 3.2.4 The concrete shall incorporate selected aggregates [supplier, product and size of aggregates].

Commentary: If more than one aggregate is to be used, the size of each and their proportions within the mix will also need to be specified (eg 30% 10-mm white quartz and 70% 14-mm basalt). 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.

- 3.2.5 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 Slab Type (include only appropriate clauses)

- 3.3.1 The decorative slab shall be constructed as [specify either a full depth slab, base with monolithic topping, base with bonded topping or base with unbonded topping] in accordance with the details shown on the drawings.

Commentary: Monolithic toppings are those placed while the base concrete is still plastic (eg coloured surface hardener), bonded and unbonded toppings are placed after the concrete has hardened.

Bonded toppings are generally 20 mm thick, while unbonded toppings are generally a minimum of 70 mm thick.

- 3.3.2 For bonded toppings, a bonding agent equal to [specify product and manufacturer] shall be applied in strict accordance with the manufacturer's specification.

Commentary: Water-based bonding agents should not be used externally. Acrylic latex types are generally recommended, or for stronger bond, epoxy-based bonding agents.

- 3.3.3 For unbonded toppings, a bond breaker equal to [one layer of 0.2-mm-thick polyethylene sheeting] shall be provided between the base slab and topping.

Commentary: Typical bond breakers include plastic sheeting, damp-and-water proofing membranes, release agents and paint/other coatings

3.4 Reinforcement (include only appropriate clauses)

- 3.4.1 The [specify slab or base slab] shall be reinforced with [specify type, size and configuration of reinforcement].

Commentary: All slabs and toppings containing polypropylene fibres (without steel mesh or bar reinforcement) shall be deemed to be unreinforced slabs and shall be designed and jointed as such.

- 3.4.2 The unbonded topping slab shall be reinforced with [specify type, size and configuration of reinforcement], and jointed as detailed in the drawings.

Commentary: Bonded topping slabs are generally not reinforced. For unbonded toppings, consider minimum topping thickness to allow for required concrete cover to reinforcement.

- 3.4.3 The required concrete cover to reinforcement shall be increased by the depth of honing.

3.5 Concrete Transportation, Placing, Compaction and Finishing

- 3.5.1 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.

- 3.5.2 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].

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

- 3.5.3 No excess mixing water shall be added to the concrete onsite, without the written approval of [specify person].

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.

- 3.5.4 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.
- 3.5.5 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.
- 3.5.6 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:
- (a) For slabs up to 100 mm in thickness, the placing, screeding and finishing operations shall be deemed to provide adequate compaction.
 - (b) 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.
 - (c) For slabs exceeding 200 mm in thickness immersion vibrators shall be used.
- 3.5.7 Mechanical vibration equipment shall not be used to move concrete, and immersion vibrators shall not be dragged over reinforcement.
- 3.5.8 Compaction of concrete shall be carried out in a systematic manner to ensure uniform aggregate distribution.

Commentary: Actions that would cause any deviation from thoroughly mixed homogenous concrete may result in non uniform aggregate distribution. Actions such as movement or distribution of concrete with shovels, working slurry up whilst screeding, any form of excessive localised vibration, non uniform compaction

pattern, personnel walking through placed concrete (most of which would be acceptable in general concrete placement) and the use of a non uniform curing method may cause discolouration or an excess of aggregate or mortar to be localised. This will be apparent in the honed concrete surface once the top layer of mortar has been removed.

- 3.5.9 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 poly tubing dragged over the surface.
- 3.5.10 The concrete surface layer must be adequately densified by either manual or mechanical steel trowelling to minimise imperfections and to increase abrasion resistance.
- 3.5.11 Kneeling boards and floats shall not be used as supports during finishing. Planking shall be provided over the slab for this purpose.
- 3.5.12 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. While honing can be used to improve the flatness of the surface, a more stringent value of 9 mm may be specified to reduce the work involved. Further information can be found in [CCAA Data Sheet Tolerances for Concrete Surfaces](#).



Dustless grinding machine

3.6 Concrete Curing

- 3.6.1 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].
- 3.6.2 Curing shall commence as soon as possible, but no later than 3 hours after finishing operations have been completed.
- 3.6.3 If the specified curing method presents construction problems, an alternative solution may be proposed by the contractor for approval by [specify person].
Commentary: Usually the principal's representative.
- 3.6.4 Honing shall not commence until curing has been completed and the concrete has attained adequate strength for honing to proceed.

3.7 Honing

- 3.7.1 Honing of the slab shall be undertaken only after the concrete has been cured see [insert clause number ie Clause 3.6.4].
- 3.7.2 Honing shall be by the [wet, dry and dustless or other] process.
Commentary: As a flatter finish is generally easier to achieve with the use of larger grinding machines, the size of machine to be used may also be specified.
- 3.7.3 The initial honing shall utilise a [30- to 60-grit] abrasive for grinding and levelling the surface. The surface shall then be honed with progressively finer abrasives from 80- to [300-grit] to remove scratch marks from the previous passes.
Commentary: The finest abrasive to be used depends on the finish required.
- 3.7.4 Honed concrete surfaces shall have a maximum deviation from a 3-m straightedge placed anywhere on the surface of [specify value].
Commentary: For smaller areas a 3-mm deviation should provide a satisfactory finish. For larger areas such as warehouse floors, such a stringent tolerance may not be needed and the cost and ability to

achieve it may be an issue. Typically in these situations a 6-mm deviation under a 3-m straightedge is satisfactory.

3.8 Sealing

- 3.8.1 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.
- 3.8.2 The sealer shall be applied and cured in accordance with the manufacturer's recommendations.
- 3.8.3 A surface maintenance and cleaning schedule shall be established in consultation with the sealer manufacturer and the installer.

3.9 Inspection and Minor Repairs

- 3.9.1 During the project [specify a number] holding points shall be established for inspection and approval of progress to the next stage.
- 3.9.2 Any surface which fails to match the agreed test panel for colour, aggregate distribution, tonal range and quality of finish, shall be repaired to the principal's specification, or removed and replaced.
- 3.9.3 Minor imperfections shall be repaired by filling with a cement-based coloured slurry and re-ground to ensure a consistent surface appearance.
- 3.9.4 All repair methods shall be trialled on the test panel prior to use on finished work.
- 3.9.5 If required, a detergent wash shall be applied to the honed surface to remove any residual cement film prior to sealing. As an alternative to detergent, a 1:50 mild acid wash may be used.
Commentary: As a mild acid wash may etch the surface and change the appearance, a small section should be specified as a test area prior to acid washing the entire area to assess the suitability of this method.

