



Apply decorative finishes to concrete

CPCCCO3044



- By the end of this topic, you should be able to:
 - Plan and prepare to apply decorative finishes to concrete
 - Apply stencil finishes with dry topping mix on wet concrete
 - Apply stencil finishes with wet topping mix on dry concrete
 - Apply stamp finishes
 - Apply exposed aggregate finishes
 - Apply textured finishes
 - Clean up after applying decorative finishes to concrete

- Colour can be provided to concrete floors and pavements in a variety of ways, such as aggregates, mineral oxide pigments, or the application of chemical stains, dyes, tints and coloured surface coatings.
- The choice of method or combination of methods depends on factors such as the colour required and its consistency over the surface, the durability of the colour, whether patterns are required, and whether the concrete surface is new or existing.

- In the wet state, common methods include:
 - Using different coloured cements in the concrete mix
 - Adding a mineral oxide pigment to the concrete (for the slab itself or that for a topping)
 - Applying a dry-shake or 'dust-on' topping (containing a pigment) to the surface
 - Adding a dye to the concrete mix;
 - Selecting special aggregates for exposed aggregate finishes
- Hardened concrete paving, both new and old, can be coloured by:
 - Chemically staining the surface
 - Applying a dye, tint or other coating/sealer to the surface
 - Exposing the aggregates within the concrete

- Aggregates:
 - These are stones and/or sands that may be exposed near the surface
- Mineral oxide pigments:
 - These are the most widely used products for colouring concrete
 - They are available as powders, granules or liquids
 - Powders are generally added to the concrete truck in bags that dissolve during mixing; however, they may also be applied as part of a dry-shake topping over fresh concrete
 - By colouring the mix, it allows for concrete to be chipped away and not show a colour discrepancy. It can also be more environmentally friendly, as the powder does not become airborne and irrespsible.
 - Liquids are often used at major batching plants



- Chemical stains:
 - These are usually applied to hardened (or existing) concrete
 - They generally produce a mottled coloured finish due to the variability with which they penetrate into the concrete
- Chemical dyes and tints:
 - Dyes and tints contain coloured particles in either a water or solvent solution and can produce colours that are not available with chemical stains (e.g. red and yellow)
 - Dyes produce mottled finishes similar to chemical stains
 - Unlike chemical stains, dyes and tints do not react with the concrete – this makes results more predictable and less dependent on the concrete consistency or weather conditions

Modifying concrete



Figure 10 Mottled finish typical of chemically stained concrete (on stamped surface)



Figure 11 Dyes and tints produce strong vibrant colours (red, yellow and orange) not possible with chemical stains [a] Chemical stain used for mottled green background and patterned border [b] Dyed image on concrete floor, work by Gerald Taylor, original artwork by Christy Shaffer courtesy of Dover Publications (with permission from Gerald Taylor)

- Coloured surface coatings:
 - Coatings range from various paint systems and concrete 'sealers' to formulated coloured cementitious materials
 - They are usually applied by brush, roller or trowel
 - They provide a uniform colour over the entire surface; however they are subject to wear and must be maintained

Modifying concrete

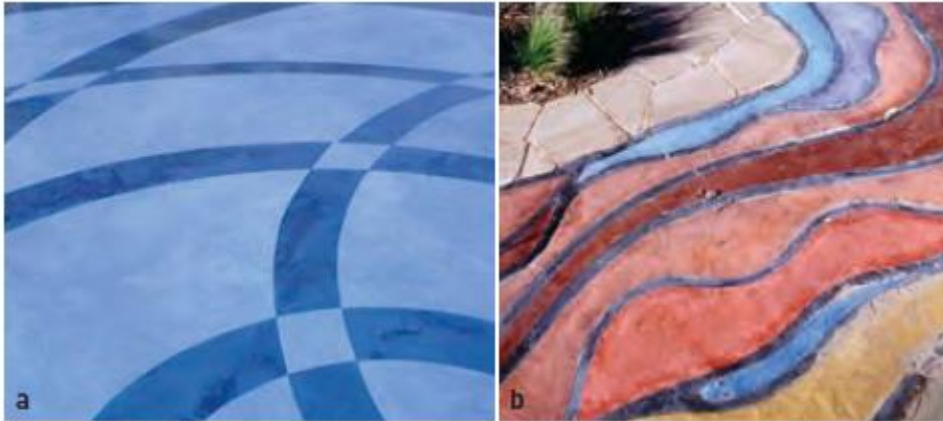


Figure 12 Cement-based coatings

[a] Dark blue areas are a coloured cement-based micro-topping approximately 1 mm thick trowelled onto the surface, light blue colour is from dye washed over surface [b] Coloured cementitious paint coating used to create designs
(with permission from Ability Building Chemicals)

- When planning and preparing to apply decorative finishes to concrete, you should review the following:
 - Task requirements
 - Plans will provide visual representations of the work
 - Speak to your supervisor to clarify work instructions
 - Be sure to clarify an unclear instruction
 - Speak clearly and directly, using appropriate language, to ensure that your queries are fully understood and addressed
 - Refer to site specific documentation, such as
 - Job Safety Analysis (JSA) which highlight hazards that may arise when working
 - Environmental plans which address issues such as clean up, waste and noise
 - Safe Work Method Statements (SWMS) which outline how risky activities are to be safely carried out
 - Site procedures and site safety plans

- When planning and preparing to apply decorative finishes to concrete, you should review the following:
 - Legislation, regulations and codes of practice
 - Ensure that task specifications meet these legal requirements
 - Relevant legislation may include *Work Health and Safety Act 2011* (Qld) and *Environmental Protection Act 1994* (Qld)
 - Relevant regulations may include *Work Health and Safety Regulation 2011* (Qld)
 - Relevant codes of practice include *National Construction Code* and *How to manage work and safety risks Code of Practice 2011*
 - Part 3.2.3 of Volume 2 of the NCC outlines the requirements for concrete and reinforcing
 - Operator's manuals for instruction on how to use plant and equipment
 - Manufacturer's recommendations on how to use equipment and materials
 - Safety Data Sheets (SDS) outline how to safely handle hazardous materials or chemicals

- When planning and preparing to apply decorative finishes to concrete, you should review relevant standards, as these provide specifications to ensure products are used as intended
- For example:
 - *AS 3600 Concrete structures* refers to materials and construction requirements for joints and embedded items in Section 17.4
 - *AS 3610 Formwork for concrete* outlines the classes of surface finish and colour control in Section 3.2
 - *AS 3758 Aggregates and Rock for Engineering Purposes – Concreting Aggregates* defines 'coarse' aggregates to be >5mm and 'fine' aggregates to be <5mm

- To prepare for decorative finishing tasks, determine the work requirements, including:
 - Time required to complete the task
 - Times may differ, depending on the type of task
 - For example: Stencil finishes with dry topping mix on wet concrete have different timeframes to stencil finishes with wet topping mix on dry concrete
 - Required materials and quantities, such as: Aggregates, oxides, dyes, stains, tints, cement, stone dust, topping dust, release agent, sealant, retardant

Ensure that you check materials against order forms to ensure intended quality and quantities are met (e.g. aggregate ratio, aggregate is correct colour). Locate them safely (e.g. out of the weather), ready for use.

- To prepare for decorative finishing tasks, determine the work requirements, including:
 - Required plant, tools and equipment
 - Plant may include: Concrete vibrator
 - Tools may include: Stencils, stamps, floats (magnesium and wood), steel trowels, squeegee, hopper guns, broom, brush
 - PPE may include: Gloves, protective clothing, wide brimmed hat, work boots
 - Safety equipment may include: Barricades to restrict access and protect surfaces, and signage to warn others (e.g. Do not enter; PPE must be worn)

Ensure that all tools and equipment are appropriately selected, prepared and used for the task (e.g. pre-operational safety checks), reporting any faults/defects to your supervisor

Carry out stencil finishes

- Stencilled patterns are made by manipulating the surface of the concrete pavement after the concrete pavement has stiffened, but before it has hardened.
- Using standard stencils, patterns resembling tiles, pavers, brickwork, stone or random paving can be produced.
- Special stencils can also be made to allow motifs, pictures and custom designs to be incorporated into the surface.

Carry out stencil finishes



Figure 15 Examples of special motifs/stencils
([a] with permission from Concrete Colour Systems)



Figure 16 Placing and embedding the stencil into the 'wet' concrete
[a] Border placed first [b] Stencil trowelled/rolled into surface (note plastic sheeting to protect adjoining surfaces)

Carry out stencil finishes

- In stencil work, waxed cardboard paper are laid on the surface of the pre-hardened concrete, masking the surface from the subsequent application of coloured material.
- Stencils can be applied in two main ways:
 - With dry topping mix on wet concrete
 - With wet topping mix on dry concrete

Carry out stencil finishes

- The general steps for applying stencil finishes is:
 - Protect the adjoining surfaces with plastic or a barrier to limit colour sticking to unwanted surfaces
 - Ensure the concrete surface is clean of loose particles and debris
 - You are not required to aggressively clean, just ensure that debris will not be incidentally on the surface
 - Prepare stencil so that any lapping maintains alignment and bond
 - Lay stencil onto surface, ensuring alignment, bond and flat
 - The recommended depth to insert a stencil into freshly laid concrete is 1-2mm
 - Apply topping mix
 - For a dry mix, this may be a mix of colour, stone dust or cement. Finish the wet concrete surface with a wood or magnesium float or steel trowel to a consistent texture
 - For a wet mix, blend the powdered mix consistently, load it into a hopper gun while we and spray under pressure onto dry stencil surface
 - Lift stencil in accordance with setting time in manufacturer's specifications
 - For wet concrete, insert specified control joints during placement and/or cut into applied finish after setting (e.g. using a saw cut)

Carry out stamp finishes

- Stamping is the imprinting of a pattern onto a surface with metal moulds or rubber mats



Figure 20 Some of the many stamped patterns and textures available
(a) Random blue stone (with permission from Concrete Colour Systems)
(b) Flagstone (with permission from Concrete Technologies)
(c) Large diamond tile (with permission from Concrete Technologies)
(d) Seamless (with permission from Concrete Technologies)
(e) Rock texture (f) Slate texture

- The procedure for stamping concrete is as follows:
 - Determine method of applying pattern in accordance with design finish and specifications
 - Protect the adjoining surfaces
 - Place the concrete slab
 - Ensure formwork is placed a finished floor height
 - Ensure stamps are clean and serviceable
 - Should they be clean or bent, they will not produce the intended pattern

Carry out stamp finishes

- The procedure for stamping concrete is as follows:
 - Find the initial starting point in line with specifications and design
 - Prepare base colour and topping dust and apply to wet concrete
 - Base coats can be levelled with trowels, broad floats or squeegees
 - Apply colours at random locations to create desired effect
 - Prepare and apply release agent to prevent the concrete adhering to the stamping mould
 - Powered releaser should be applied by hand or brush
 - Use stamp to create designed pattern and surface effect
 - Stamping with sufficient pressure will ensure an adequate bond of the colour release agent to the base coats. This is why the highlight effect generally occurs in deeper joints and impressions.
 - Insert specified control joints during placement and/or cut into applied finish after setting
 - Where possible, joints should coincide with grooves in the pattern
 - Clean concrete of release agent and other debris
 - Apply sealant to protect from UV rays, resist marking effects of dirt/grime/moss/salts/oils
 - Always ensure the concrete surface is dry before applying sealer
 - Apply surface sealers evenly with a broom or brush, using 2-3 coats – estimating the required amount by the area

- The procedure for creating exposed aggregate finishes is as follows:
 - Incorporate selected aggregates into concrete mix
 - Lay concrete to ensure exposed stone is uniform
 - If the concrete is not uniformly compacted, this will result in uneven exposure of coarse aggregates
 - Remove surface matrix to expose aggregate
 - This may be followed up by applying chemical retardant to allow ease of matrix removal
 - If retarders are applied at varying thickness, different depths of aggregate exposure and intensity of colour will result when the surface is water washed
 - Leave exposed aggregate
 - Insert specified control joints during placement and/or cut into applied finish after setting (e.g. using a saw cut)
 - Apply sealant to surface

- An understanding of the effects of the physical properties of the aggregates on the concrete in its plastic (wet) and hardened states is beneficial when selecting suitable aggregates.
- Colour
 - Coarse aggregates are available in a range of colours including white, black and green quartz, dark grey basalt, brown and red gravels
 - Fine aggregates (sands) are also available in a range of colours.
 - For lightly abraded surfaces (e.g. light abrasive blast or lightly honed finish) the predominant colour will be that of the fine aggregates.
 - Where the coarse aggregates are exposed, they will usually provide the dominant colour to the finish.
 - In these situations, the cement matrix (mortar) between the stones can either be left uncoloured or if pigmented, the colour is usually selected to match/blend with that of the aggregates

- An understanding of the effects of the physical properties of the aggregates on the concrete in its plastic (wet) and hardened states is beneficial when selecting suitable aggregates.
- Size
 - The size of the aggregate should be appropriate for the application.
 - Smaller 3- and 6-mm pebbles are ideal for pools, pavements subject to barefoot traffic and stiletto heels.
 - The maximum size recommended for barefoot traffic is 10 mm
 - Coarser aggregates provide a surface texture that is generally too rough.
 - Bike paths, general-use pavements and streets could use up to 20-mm aggregates to allow improved drainage of the surface

- An understanding of the effects of the physical properties of the aggregates on the concrete in its plastic (wet) and hardened states is beneficial when selecting suitable aggregates.
- Shape
 - The shape of the aggregates will affect the workability of the fresh concrete and its strength when hardened.
 - Smooth, rounded aggregates enhance the workability; however, rough cubical stones (generally crushed to size) produce optimum strength.
 - Flat and elongated aggregates, referred to as misshapen particles, reduce workability and may also have an adverse affect on strength because of their tendency to selective orientation and bridging, resulting in air pockets.
 - A good mix design will limit the percentage of these particles in accordance with AS 2758.1.

Carry out exposed aggregate finishes

- Selected aggregates can be added to the concrete in a number of ways:
 - Incorporated integrally throughout the entire concrete mix
 - A special mix with selected aggregates mixed through the concrete can be ordered from a pre-mixed concrete supplier.
 - Concrete is placed, screeded and bullfloated to the finished level, ensuring an even cover of about 2 mm of cement mortar to the aggregate at the surface.
 - Contained in a topping mix
 - To reduce the cost of the special aggregates, they can be incorporated into a topping mix.
 - Toppings also allow correction of surface levels, finishes for existing slabs and, if applied at the end of construction, reduce the risk of damage from construction activities.
 - Seeded onto and then embedded into the surface of the concrete
 - Selected aggregate(s) are hand-cast or seeded onto the surface immediately after screeding and then bullfloated into the surface prior to bleedwater appearing or applied to the surface once all the bleedwater has evaporated and fully embedded by tamping and repeatedly working the surface with wood floats
 - Set into the surface at particular positions

- The common methods used to expose aggregates are:
 - **Water washing**
 - Brushing and flushing the surface with water soon after concrete has stiffened
 - Method used when the objective is to reveal large aggregates by up to a third of their size
 - **Abrasive blasting**
 - Applied to hardened concrete
 - Erodes the surface cement matrix by sand blasting or grit blasting
 - **Honing**
 - Applied to hardened concrete
 - Grinding that produces a smooth but dull, matt finish surface
 - **Acid etching**
 - Similar to a water wash-off method, but using an acid wash

Carry out exposed aggregate finishes

- Tips when exposing aggregate:
 - Ensure the stones are 100% flat
 - All holes are to be filled in with stone, not slurry
 - Ensure that you control slurry run off in line with environmental requirements
 - For example, use a wet vac, sand bags, silt socks or geofabric

Carry out textured finishes

- Textured finishes have traditionally been used to create a decorative surface or to provide slip and/or skid resistance.
- Finishes may vary from light textures such as those from nylon brooms or wood floats to heavier textures produced using tools such as hard bristle brooms, hessian drags over the surface or metal rakes.
- Providing texture by exposing the aggregate or creating voids in the surface can also deliver a decorative as well as functional finish (e.g. when the surface is to be used by traffic)
- Similar to other types of finishes, pigments can be used to reduce glare and further enhance the appearance.
- The coarseness of the texture should suit the application.
 - For example, if the foot traffic in public areas includes people wearing stiletto heels, coarse textures such as exposed aggregate and deeply grooved surfaces may not be appropriate.
 - Around swimming pools or other areas intended for barefoot use, coarse textures are generally inappropriate and finer textured finishes providing a compromise between slip resistance and comfort should be specified.

- The procedure for implementing textured finishes is as follows:
 - Determine the method of applying texture in accordance with design finish and specifications
 - Prepare and apply topping dust
 - Float base colour into surface
 - Base coats can be levelled with trowels, broad floats or squeegees
 - Apply colours randomly, where specified, onto surface to create decorative type colourings
 - Apply finish with trowel or other tools to create design pattern and surface effect
 - Varying the slump and viscosity of the topping coat can produce different textures
 - Insert specified control joints during placement and/or cut into applied finish after setting (e.g. using a saw cut)

- Floating is a common method of applying textured finishes
 - Magnesium and wood floats may be used to finish concrete surfaces
 - A steel trowel may also be used
- The purpose of floating a concrete surface is to produce a relatively even but still open texture.
- Floating may be used to:
 - Embed large aggregate particles or special items that have been seeded into the surface of the plastic concrete
 - Remove slight imperfections and produce a surface closer to the true plane
 - Compact the concrete and consolidate the mortar at the surface in preparation for other finishing operations
 - Close minor surface cracks which might appear as the surface dries

Carry out textured finishes



FIGURE 60

Wood float finish

- A broomed finish is another common type of textured finish
- Brooms of varying degrees of stiffness can produce finishes that are both functional and attractive
 - Polypropylene and horsehair bristles will produce light textures
 - Poly fibre bristles are used for medium and coarse textures
 - Special long soft plastic bristles are used for texturing over long distances to reduce the risk of mortar being dragged across the surface or clogging the bristles

Carry out textured finishes



FIGURE 62

Light broom texture can provide a functional and attractive finish

Carry out textured finishes



FIGURE 63

Broomed finish to provide slip and skid resistance



FIGURE 64

Medium to coarse broomed texture suited to industrial applications

- A tined/grooved finish is another common type of textured finish
- Tined finishes provide a coarse texture by forming a series of grooves that are achieved by dragging steel tines across the concrete surface
- They are typically used on road surfaces to provide the required macro texture for skid resistance at higher speeds and to assist with drainage of the surface. They may also be used to improve skid resistance on steep grades.
- While tined finishes are typically used for major road projects, smaller hand-held tools (known as flat wire brooms) are available for smaller projects.

Carry out textured finishes



FIGURE 65

Tined finish on roadway – note set pattern in spacing of grooves

[a] Tining operation

[a] Tined finish



FIGURE 66

Grooves formed in steep ramps
for drainage

Carry out textured finishes

- A hessian drag finish involves dragging a hessian across the surface to create a textured finish
- Used mainly for road surfaces, it is applied following compaction, screeding and finishing (steel trowelling) of the surface.
- Applying the finish after trowelling of the surface also assists in preventing the hessian from clogging with otherwise loose/wet material from the concrete surface.



FIGURE 67

Hessian being dragged across
the concrete surface

Carry out textured finishes

- An assortment of rollers can be used to texture the surface of concrete.
- Larger rollers with specially textured surfaces for imprinting concrete are often used for stamped concrete work; however, a range of smaller rollers are also available for producing finishes such as stippled surfaces
- The common fault with this texturing method is its use on surfaces which have been only lightly trowelled, typically by 'stick trowelling'.
 - Stick trowelling with a telescopic pole reduces the direct pressure on the surface and can dramatically reduce the surface compaction achieved.
 - Indications of insufficient surface compaction include leaving a trailing edge line when the roller is passed over the surface and wave caps produced in the uncompacted and plastic surface layer.
 - An inadequately compacted surface layer will generally be subject to excessive wear.

Carry out textured finishes



FIGURE 68

Stippled surface finish produced by using a textured roller

Clean up

- At the conclusion of decorative finishing tasks, the following should be undertaken:
 - Clean work area
 - Dispose of, reuse or recycle materials according to regulations, codes of practice and job specification
 - Clean, check, maintain and store plant, tools and equipment according to manufacturer recommendations and standard work practices
 - Report any faults via the plant logbook, fault form and/or to supervisor

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