



INTO THE ROUGH

Roughly textured concrete is enjoying a renaissance. Elaine Toogood explores the different aesthetics and the techniques used to create them

Contemporary construction methods often dictate that the surface of formed concrete is smooth. But rough textures offer a variety of alternative aesthetics, which are becoming increasingly popular. Arguably, the simplest means of creating heavily textured concrete is to cast it against a textured surface. A huge range of effects can be achieved with flexible form liners, either pre-

formed or bespoke. The defining characteristic of this process is that the surface remains intact, with aggregates hidden behind a smooth paste of cements. For deep textures, the best results are produced by casting horizontally with liners placed in the base of the mould, which reduces the risk of leaving the recesses unfilled.

Smooth concrete can also be given a rough texture after the formwork has been struck with “post-finishing” techniques to remove or break part of the surface and expose the aggregate. Depending on the technique used, the texture can vary considerably.

OPPOSITE The textured internal concrete surfaces of Mole Architects' The Houseboat were created by shot-blasting the in-situ concrete surfaces to reveal natural aggregates. The external photo shows the concrete frame under construction

RIGHT Bush-hammered concrete is one of the defining characteristics of the Barbican estate in London

BELOW Peter Zumthor's Bruder Klaus Field Chapel in Germany, created from rammed concrete made using aggregates from the surrounding fields

Surface retarders are proprietary liquids or gels that prevent the surface of new concrete from hardening. For formed concrete, a coating (known as a negative retarder) is applied to the inside of the formwork in place of a release agent. Once the formwork is struck, the soft surface of the unset mortar that has not set is washed or brushed away to reveal a plane of exposed aggregate. The amount of surface removed or "depth of etch" is controlled through the grade or strength of retarder, with the option to reveal much of the undamaged shape of the coarse aggregate. Timing is critical with this method and a warmer ambient temperature and higher strength of concrete will reduce the window of opportunity to remove the surface before it starts to harden again. This



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technique is therefore more often used in the controlled conditions of a precast factory rather than on site, although retardants are commonly used for unformed in-situ concrete.

Shot and grit-blasting can be used to create rough textures on hardened concrete, including in-situ concrete. Such abrasive blasting is generally used to remove surface coatings but can also reveal either small or large aggregate, depending on the amount of mortar removed. Workmanship should be tested in advance to agree standards and techniques. The Concrete Society publication *Visual Concrete – Finishes* suggests that a heavy, or deep, abrasive blast is best carried out when the concrete is still relatively weak – for example, one to two days after placement – whereas a light abrasive blast may take place between three and seven days later. Concrete can of course be abraded much later than this, but the process, like the concrete, will be that much harder.

As with any post-finishing technique, an allowance for extra cover is required to ensure the minimum designed depth is maintained, and of course the size and type of aggregate used is in the mix is fundamental to the final aesthetic. The textured internal concrete surfaces of The Houseboat in Poole by Mole Architects were created by shot-blasting the in-situ concrete surfaces to reveal natural aggregates from the Mendip hills.

There are many examples of mid-20th century precast and in-situ concrete structures featuring heavily textured surfaces, many created by tooling the concrete once it had hardened. These finishes include bush-hammering and point-tooling as well as those with a needle-gun finish. All are

RAMMED CONCRETE IS RATHER NICHE, BUT HAS A STRONG AESTHETIC APPEAL REQUIRING CLOSE ATTENTION TO MIX, PROCESS AND TESTING

appropriate for creating a rusticated, bumpy surface that may or may not reveal the shape of the coarse aggregate. More recently, health and safety concerns have limited the use of these techniques to very controlled situations, often factory-based. A notable recent in-situ example is 21 Caroline Place by Amin Taha Architects (CQ 260, summer 2017), where the specifically sourced white aggregate was exposed on the soffit and walls of the basement interior by bush-hammering away 30mm of the surface. Another example is the hammered ribs found at Walmer Yard, a housing development in London by Peter Salter.

It is also possible to achieve texture within the cast surface of the concrete itself simply by lack of compaction or by using special mixes to create holes or gaps, such as no-fines concrete. Rammed concrete would fall into this category. Rammed concrete is a method for compacting fairly dry, hand-batched concrete, rammed manually into the formwork in layers to create a highly individual stratified and often crumbly textured concrete. A well-documented example is the Bruder Klaus Field Chapel in Mechernich, Germany, designed by Peter Zumthor using aggregates from the surrounding fields. This method of placing concrete is not suitable for reinforced concrete, and so walls must be wide enough to provide the necessary stability to support themselves, as well as to provide sufficient space in the mould for the concrete to be tamped. The amount of concrete that can be placed in one day is restricted, thereby creating numerous horizontal layers. This combination of labour intensity and structural limitation renders the method difficult to produce at scale. It is therefore rather niche, but has a strong aesthetic appeal requiring close attention to mix, process and testing to create the desired effect. It has been specified by Zumthor again for the walls of Secular Retreat, a project currently under construction in the Devon countryside.

At a recent Concrete Elegance presentation for The Concrete Centre, Ian Bramwell of Mole Architects, the architect of The Houseboat and executive architect of both Secular Retreat and Walmer Yard, referred to creating the concrete as an “artisan” process. This is a term often used in the food world for activities such as bread-making, and usually intended to express care, expertise and quality of ingredients. As Bramwell says, perhaps creating highly textured concrete is less about being rough and more like baking very “well-bred bread”.

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TOP The new visitor centre at Yorkshire Sculpture Park is set into the landscape of a former quarry

MIDDLE Its sawtooth roof is formed as a series of inclined reinforced concrete beams spanning 10.5m over the gallery

ABOVE Within each 1.2m lift of formwork are four sub-layers, each containing a different concrete mix

RIGHT The concrete beams have curved profiles that draw light into the gallery and across their board-marked surfaces

PROJECT TEAM
Architect Feilden Fowles
Structural engineer engineersHRW
Main contractor William Birch & Sons
Concrete contractor Northfield Construction



◀ Visitor Centre and Gallery, Yorkshire Sculpture Park

The new gallery and visitor centre at the Yorkshire Sculpture Park is set into the hillside of a former quarry, a location that has informed and inspired its construction and appearance. It was conceived as “a sculptural element, emerging from the earth”, says Fergus Feilden of architect Feilden Fowles. “We wanted the building to read as being ‘of the land’ with texture and layers like geological strata.”

Cement-stabilised, rammed earth was investigated as an option, but was discounted due to detailing constraints dictated by the material, which would have compromised the architectural design intent and reduced durability in comparison to concrete. “Rammed earth needs to be protected to be durable,” explains project engineer Chris Stobbart at engineersHRW. “Walls using this technique are typically made with ‘good boots and a good hat’, with the rammed earth raised above the external ground on an upstand with well-drained footings and with generous overhanging eaves at the top to protect the walls. Concrete was able to offer increased durability with less risk to the client and more flexibility to achieve the desired architectural finish.”

Rather than physically ram the concrete in place, the walls were constructed using reinforced concrete poured in shallow layers. Within each 1.2m lift of formwork are four sub-layers, each containing a different concrete mix with varying pigments and aggregate. The formwork was pre-treated with retardant so that, once struck, the face of the concrete could be jet-washed to expose the aggregate and provide the layers of rough texture required.

engineersHRW specified structural parameters for the mix within typical limits for reinforced concrete. By testing and developing sample panels, the contractor determined that it could achieve the desired architectural appearance with a standard S3 consistence class. This provided a mix that was well graded to give an even distribution of aggregates without segregation.

The compressive strength of each mix was confirmed by cube testing. The sub-layers within a 1.2m lift were each poured before the sub-layer below was fully cured thereby allowing them to blend together to give a better shear interface. “Some small variation in stiffness between layers is expected due to the use of different aggregate types,” says Stobbart, “but since each layer is relatively long and consistent between vertical joints, local stiff points within a wall panel are avoided. Otherwise, they could lead to cracking.”

The jet-blasting was accommodated by increased cover to the reinforcement bars. This increased cover together with the wide spacing of the reinforcement, also enabled adequate compaction of the textured concrete when poured in such shallow layers.

Concrete subcontractor Northfield Construction built four sample walls in its yard to test out different construction techniques, including tests for shot-blasting, types of retardant and curing times between pours. Part of the north wall in the building was also used as a construction trial. Only after such careful consideration and testing was the final combination of mixes and finishing processes scheduled for construction.

The project also includes structural concrete exposed internally with smooth, in-situ walls enclosing the gallery space. Its sawtooth roof is formed as a series of inclined reinforced concrete beams spanning 10.5m over the gallery. The curved profiles draw north light into the space and across their timber-board marked surface. Each profile incorporates a slotted lighting track and cast-in fixing points for the gallery to suspend artworks. As well as the gallery space, the building includes a restaurant, shop and public foyer. It is due to open in September.