

concrete

Visit: www.concrete.org.uk



Exposed concrete The challenges of board marking

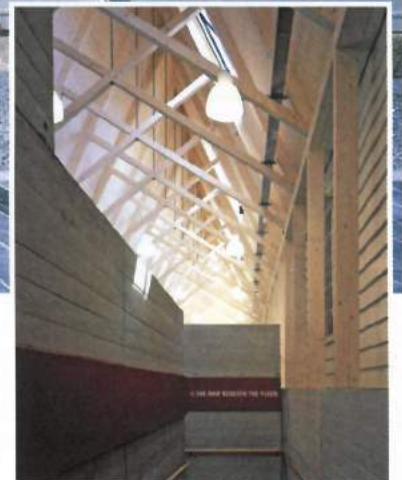
Reinforcement
The use of headed bars

Sprayed concrete lining
Enhancing performance

Command of the Oceans

The Historic Dockyard Chatham

External view of the link building from the north. (Photo: Hélène Binet)



Link building interior showing the exposed board-marked panels.

Brendan Higgins of Baynes and Mitchell Architects looks at the use of exposed concrete for a new entrance building within Chatham's historic dockyard.

In 1995, the timbers of an unknown ship were discovered beneath layers of floorboards in one of the many scheduled monuments at The Historic Dockyard Chatham. Hailed as the most significant naval archaeological discovery since the *Mary Rose*, these timbers became the focus for a new grant-funded conservation and reuse project that would create a sense of arrival for telling the story of the dockyard and its people.

Baynes and Mitchell Architects proposed constructing a new entrance building between two existing scheduled monuments, facilitating the creation of a sunken gallery space that would completely enclose the timbers and provide an intimate new display area.

To achieve this, an excavation between the two existing scheduled monuments, to a level below the 100-year flood datum, was required. Concrete was a natural choice due to its ability to provide the structural and waterproofing requirements within this excavation. Given the budgetary and spatial constraints, it made sense to continue the

use of concrete out of the ground, using the process of casting to provide a surface finish that reflected the dockyard traditions of robust materials and practical craftsmanship.

The heyday of the dockyard at Chatham was the mid-18th Century, when British naval power and dominance was at its height and the dockyard was tasked with manufacturing huge wooden warships. As a result, this industrial landscape was a vast production line for the processing of timber and today remains the best-preserved dockyard of the age of sail in the world. The architect wanted to reflect this relationship with timber in the materials used within the new building.

A horizontal board-marked finish to the concrete face was chosen, with alternating smooth planed and sand-blasted Douglas fir boards used as formwork. These boards were arranged randomly on several standardised casting panels, which were reused throughout the build. The timber surface was coated with a sealant, which enabled high reuse without significant board degradation.



Imprint of sand-blasted Douglas fir board.
(Photo: Baynes and Mitchell Architects.)



Freshly cast panel and formwork.



Undercroft, with the remains of the unknown ship. *(Photo: Hélène Binet.)*

Client

Convincing the client that the board marking was integral to the material palette was not without its challenges. Several locations were visited where different formwork materials and practices had been used, discussing the pros and cons of each. Despite some early scepticism, the client is delighted with the finished result, if also slightly bemused at the amount of visitors who end up stroking the walls.



Gap between buildings at completion of concrete construction.

Visual appearance

The concrete specification advisor, David Bennett, suggested that in order to enhance the visual appearance of the timber grain on the concrete surface, a concrete with 30% fly ash cement replacement be used. This gives the concrete a mid-grey colour, allowing the grain of the timber to be read in the daylight spaces of the building, where a lighter concrete would have been too reflective and perhaps resulted in a loss of definition. The

cement replacement also significantly reduces the embodied carbon of the concrete.

A test panel was built prior to construction, designed to incorporate all the major joints and junctions that would be encountered during the build. This proved to be an invaluable exercise. Several separate attempts were made, each of which suffered from a range of maladies. These included poor compaction, resulting in large air pockets on the concrete surface, black-eye from grout loss at tie-bolt locations, and honeycombing from grout loss at panel junctions. In the end, despite not achieving approval for the test panel, the contractor opted to proceed (at its own risk) with construction in order to maintain the programme.

Thankfully, the lessons learned during the construction of the sample panel proved to be sufficient and the first panels of the build achieved the quality of finish that was targeted. Subsequently, these panels formed the quality control panels, against which the rest of the build was judged.

As the first project in which the architect has used exposed concrete to any great degree, the process has been a significant learning curve. Early engagement with the client certainly helped the cause, giving the time required to do the necessary research and obtain the right technical advice. There were times during construction when patience (and nerve) were tested, but the combined drive from client, contractor and design team to achieve the right result saw the project through. ■



Freshly cast panel.

Drawings

Setting-out drawings for the boards were prepared in advance of construction, locating the key areas where full-width boards needed to be visible. Tolerance was a key issue for the design of the concrete base, as there are no internal finishing materials within the building and almost every junction is visible to some degree. A tolerance of $\pm 10\text{mm}$ was allowed for in the concrete construction and wherever possible to minimise the inclusion of cast-in fixings in order to maximise flexibility for the installation of the timber frame. The glue-laminated timber sits directly onto the concrete 'plinth', with a 10mm shadow gap to the base of the columns.

View of site from roof level.
(Photo: Baynes and Mitchell Architects.)

