

# Brunel cement find is world first

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Archaeologists working on a site in the Bristol Docks have discovered what is thought to be the first ever substantial use of Portland cement in the construction of a major building. The building was designed in 1839 by the great Victorian engineer, Isambard Kingdom Brunel, to house the machinery to fabricate the world's first screw-propelled iron ship, the ss Great Britain.

The discovery came to light when Bristol University's Dr Mark Horton investigated the archaeologists' findings whilst on a visit to the Great Western Dockyard.

Wessex Archaeology was carrying out a detailed investigation of the site on behalf of Linden Homes and the ss Great Britain Trust before construction work on a new development began earlier this year.

The excavation has uncovered the floor plan of a massive 20 by 50 metre Steam Ship Engine 'Factory' that survived until it was bombed during the Second World War.

The original floor comprised a continuous slab of concrete, up to 400mm thick, which was an aggregate of Portland cement and broken-up stones. It is believed that the massive concrete slab was intended to support machinery, including the first Naysmith steam hammer, which was designed specifically to build the ss Great Britain.

The use of Portland cement has been confirmed by laboratory analysis by Professor Geoff Allen of the Interface Analysis Centre at the

University of Bristol. This has included both chemical analysis and microscopic examination of sections of the cement. Further tests have been undertaken at the Department of Civil Engineering on the strength and hardness of the world's oldest surviving specimens of Portland cement.

Dr Mark Horton of the University's Department of Archaeology and Anthropology said: "I was amazed to see an enormous expanse of cement floor – part of a floor built significantly earlier than when cement was first meant to have been used."

He added: "We already associate Brunel with a long list of world-firsts, but now we can add cement to this. His genius lay in identifying the revolutionary materials that built the modern world."

Nigel Palmer, managing director of Linden Homes (Western), said: "The Great Western Dockyard development has been designed to reflect aspects of the original steam engine factory which was destroyed in World War II.

"Before construction work on the new development got underway we were keen that archaeologists should have the opportunity to carry out detailed investigations in order to document and record the fascinating history of this important site. We are really pleased that this exciting find of early Portland cement has been discovered – another first for Brunel and Bristol."

While concrete has been known from Roman times, all modern concrete structures owe their origins to the invention of Portland cement in 1824 by Joseph Aspdin. This substance, initially produced on a very small scale, was called Portland cement because of its similarity to stone.

It is recorded that Brunel experimented with Aspdin's cement in 1829, to

repair a breach in his father Marc Brunel's River Thames tunnel, but the new material initially had a limited use and the preheating of the ingredients – limestone and clay – was to a low temperature. Until the Bristol archaeological discovery, it was thought that 'modern' cement dated to between 1843 and 1845, when Aspdin's son William, and Isaac Johnston worked with higher temperatures to make what we now call Portland cement.

It seems likely that Brunel and colleagues realised the potential of the new material and were keen to try it out on the new building in Bristol, some four years before it was being officially marketed as 'Patented Portland Cement'. The faith in the new material was fully justified, and today surviving sections remain very hard and solid, just as it was laid down 168 years ago. By the mid nineteenth-century Victorian engineers were using Portland cement routinely in their building works.

Source: University of Bristol

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