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The Project

Located in the heart of the City of London, this prestigious office development has set a new benchmark for the use of recycled secondary aggregates and secondary cementitious materials.

Developed by Stanhope, the nine-storey, 18,000m^2 office demonstrates sustainability as an integral part of the construction process. The engineer, Arup, chose to use china clay stent as a natural coarse aggregate to replace the use of primary quarried Croft granite. In addition, the project used a secondary cementitious material - fly ash. Although the use of secondary cementitious materials such as fly ash is well established, what makes One Coleman Street different is that rather than the commonly employed level of 30% fly ash by mass of cement, Arup used a higher content of up to 40% as standard.

The use of china stent and fly ash plus the use of reinforcement manufactured from 100% scrap metal increased the recycled/secondary value of the concrete to as much as 77% depending on the amount of reinforcement in an element.

Stent solution

Stent is the term used to describe the waste granite rock material that has been separated from kaolin (china clay) by high-pressure water jets. For every tonne of china clay, approximately 4.5 tonnes of stent is produced along with other waste, which is usually tipped onto ever-growing surface spoil heaps.

Conventional wisdom has been that stent was not of a sufficiently high quality to enable it to be used as a concrete aggregate. Evidence to refute this comes from the long history of stent's use in ready-mix concrete in Cornwall and Devon. One Coleman Street is the first major use of stent outside the South-West.

The stent that was supplied by Bardon Aggregates from the Littlejohn Quarry near St Austell was selected in order to meet the requirements of BS EN 12620 and PD 6682-1 for concrete aggregate. Despite sourcing the stent from a quarry 250 miles away there were no additional lorry journeys. Instead, a total of five 1,200 tonne train loads travelled from the quarry site to the rail head at Bardon's concrete plant in Bow, London. The use of the stent meant that 6,000 fewer tonnes of china clay waste were deposited onto the spoil heaps and equally, 6,000 fewer tonnes of primary aggregates were quarried.

Another environmentally sensitive decision was to use 40% fly ash by mass of cement in the structure's C32/40 pile caps and 35% in the C28/35 and C32/40

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The Salvation Army
Sheffield Learning Resource Centre Library
St Lawrence College, Kent
Windsor Building, Madrid
Brewery Wharf
Lake House, Etonbury, Bedfordshire
Beetham Tower
Marine Crescent, Folkestone
Slice House, Brazil
Trebor Mint Factory
Gloucester Docks Car Park

superstructure elements. In the watertight concrete ground slab, the fly ash content was restricted to 30% simply to meet the specification requirements of the admixture producer.

Project team liaison

Because of the innovative nature of the concrete, discussions between the parties involved commenced well in advance of construction to allow time to obtain test data, develop mix designs and perform trials. Full test data for the aggregate's physical properties, petrographic characteristics and alkali-silica reactivity were obtained to ensure that no risks were taken and that the material could fully meet the project procurement requirements. It was realised at the specification stage that the stent aggregate concrete would cost a little more per cubic metre than its conventional equivalent. This was largely due to the transportation and testing costs. However, these extra costs were partially offset by the fact that stent is exempt from the UK aggregates levy and if used more often for future projects there would be less need for extensive testing.

Project team

Client: Stanhope
Architect: Swanke Hayden Connell Architects; David Walker Architects
Engineer: Arup
Construction Manager: Bovis Lend Lease
Main contractor: John Doyle

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