RECYCLING OF CONCRETE PAVEMENTS COULD PROVIDE ECONOMICAL AGGREGATES

Source depletion has led to rapidly rising costs of aggregates derived from natural sources such as crushed stone, natural sand, crushed gravel, but concrete pavement recycling can provide an alternative aggregate resource that is both economical and sustainable, says Bryan Perrie, CEO of Cement & Concrete SA (CCSA).

Perrie says recycling concrete roads is a relatively simple process that involves breaking, removing, and crushing hardened concrete from suitable sources to produce recycled concrete aggregate (RCA).

“Concrete pavements are 100% recyclable and have been extensively used in Europe since the 1940s and in the U.S. since the 1970s.

In fact, concrete recycling for paving applications is now carried in more than 40 American states, with RCA production in the U.S.A. averaging well above 100 million tons. The main application of RCA has been as a sub-base material. Still, it also has been used in concrete and asphalt concrete paving layers, high-value rip-rap, general fill and embankment, and other applications.”

Perrie says a major incentive for concrete pavement recycling is cost savings. According to an American study, aggregate costs for fill, foundation, and surface layers make up one of the highest costs of highway construction: between 20 and 30%. Concrete pavement recycling saves most of these costs.

Perrie says cost savings from concrete pavement recycling vary but have been reported to be as high as the dollar equivalent of over R70 million on a single American project. Furthermore, concrete pavement recycling is an environmentally sustainable option that:
·Conserves aggregate and other resources.
·Reduces unnecessary consumption of limited landfill space.
·Saves energy.
·Reduces greenhouse gas emissions, and
·Captures carbon dioxide (CO2) from the atmosphere.

Concrete recycling eliminates the need to extract new aggregates and reduce haul distances and fuel consumption associated with aggregate supply and concrete slab disposal.

“RCA particles – which tend to be extremely angular – consist of reclaimed virgin aggregate, reclaimed mortar, or both. Reclaimed mortar generally has higher absorption, lower strength, and lower abrasion resistance than most virgin aggregates. RCA therefore generally has lower specific gravity and higher absorption than the virgin aggregate.”
“The properties of a specific recycled concrete aggregate depend upon many factors, including the properties of the original concrete and the processes used to produce the RCA, particularly the crushing operations.

RCA can be produced to meet quality and grading requirements for almost any application with proper process control. It should be considered an engineered material for which the properties must be determined at the outset so that appropriate mix design or construction adjustments can be made.

“When RCA is used in the production of new concrete mixtures, its effect on the properties of those mixtures can range from minimal to significant, depending upon the nature, composition, and gradation of the RCA. For example, when little reclaimed mortar is present in coarse RCA, and virgin fine aggregate is used, the handling characteristics and engineering properties of the new concrete properties will be practically the same as if all virgin aggregate had been used. But if the new mixture contains only coarse and fine RCA, these characteristics and properties will be substantially different from traditional concrete mixtures when all other mixture design factors remain constant.”

Perrie adds that recycled concrete aggregate has been used to construct hundreds of highway construction projects in the U.S. and around the world in the past 50 years as pavement fill, foundation, sub-base, and surface courses for both asphalt and concrete. Successful projects range from relatively low-volume roads to some heavily traveled highways, such as the Eden’s Expressway in Chicago.