

Reclaimed Concrete Aggregate



Concrete crusher.

Introduction

Reclaimed concrete aggregate (RCA) is a popular substitute for natural stone aggregates, especially in metropolitan areas that are finding their aggregate sources to be increasingly distant. RCA is obtained from the demolition of Portland cement concrete (PCC) structures such as PCC pavements, sidewalks, curbing, building slabs and runways. The concrete may be hauled to a central facility for stockpiling and processing, though on transportation projects the concrete is often crushed in place using a mobile plant. Processing generally involves crushing the concrete and screening it to remove soil and fine particles. Reinforcing steel is removed during processing by magnetic separators. The resulting RCA is composed of high quality mineral aggregates bonded to pieces of the hardened cement paste. RCA properties make it appropriate for use as aggregate in new PCC, granular fill and base course layers in pavements.

Applications

Using RCA for granular base applications in highways is a simple but high value use of the material, and is currently allowed by 38 states. The material is screened to meet the required gradation, and then placed and compacted using standard equipment. The RCA is a highly angular aggregate with good bearing strength and drainage properties, providing an excellent foundation for the hot mix asphalt layers. Some projects have shown that the RCA can actually gain strength with time due to self-cementation, and other projects found that the RCA helps stabilize wet, soft, underlying soils. In addition, mobile plants can be used to crush old PCC pavements at the site for immediate reuse. This eliminates transportation costs for new aggregate. Some states have noted that alkaline runoff from RCA can lead to clogging of edge drains; however, this problem can be avoided by restricting the use of RCA near geotextile filters and drains.

There is also growing interest in using RCA as coarse and fine aggregate in new PCC elements, as evidenced by a new AASHTO provisional standard. RCA fines are limited to about 10 to 20 percent of the fine aggregate because of the increased water demand, and coarse aggregate should be pre-wetted prior to mixing. PCC made with RCA often has a lower strength than PCC made only with natural aggregates. However, field experience has shown that PCC made with RCA and natural aggregates performs well when made using appropriate design procedures.

RCA can be used in embankments or fill, though high quality aggregates are not normally used for these applications. However, on site processing of concrete to provide fill or embankments can provide an economic and environmental benefit by reducing the need for importing virgin aggregate.

Environmental Benefits

Several research studies have shown that leaching of heavy metals from RCA made from well cured concrete is not an issue. Some states have reported high pH runoff from RCA, though this can be alleviated by not placing RCA in wet or low lying areas. In general, using RCA has a number of positive environmental benefits. RCA provides a high quality construction material that reduces the need for mining virgin aggregate and the associated use of water, fuel and reduces carbon dioxide emissions. Reusing RCA saves valuable landfill space. The use of RCA in metropolitan areas reduced the need for transporting natural materials from distant quarries, and eliminates the need to transport the concrete to disposal sites, again saving fuel and reducing emissions.