

RECYCLING PORTLAND CEMENT CONCRETE  
AND  
ASPHALTIC CONCRETE

by George Calvert  
Materials & Research Engineer  
Iowa Department of Transportation

The Iowa Department of Transportation has found itself in the same position as other highway construction agencies in that we are facing shortages of many of our road building materials. The shortages that are the most costly are related to gasoline, fuel oil and other fuel products. Great quantities of fuel are consumed in the smelting and refining of steel. Large quantities of fuel are used to manufacture cement. The asphalt in the asphaltic concrete is a fuel in itself with a very high BTU value. The Iowa Department of Transportation is making every effort to devise ways of conserving fuel. We also recognize that we have shortages of other materials just as costly and just as difficult to solve, therefore, we are working on the shortage problem associated with aggregate at the same time that we are working on the fuel shortage. In many cases they are one and the same.

This last year a research project was constructed on Highway 75 immediately south of Rock Rapids in which we removed and crushed asphaltic concrete and portland cement concrete and recycled these materials as aggregates in portland cement concrete. At approximately the same time that this project was going on, Kossuth County was constructing a project in which 80,000 tons of old asphaltic concrete and bituminous treated base was being recycled and reused as asphaltic concrete base and surface course.

We have already let the grading phase of a reconstruction project where the old P.C. concrete will be removed and crushed for aggregate in the new roadway. This project is approximately 15 miles long. It will be completed in 1978. It is located in Southwestern Iowa on Highway 2 between Bedford and Clarinda. We anticipate receiving some very worthwhile cost data from a project this size. We are also recycling a short section of P.C. paving on I-680 north of Council Bluffs and using it in the subbase and P.C. shoulders.

Aggregates are becoming very scarce in this and other areas of Iowa. In some locations we are having to remove over burden that is 80' or more in depth. This is costly in terms of fuel and raises the selling price of the aggregate considerably. Even then many of the aggregates that are uncovered are undesirable in one or more respects. Approximately the southern one-third of the state has only "D" cracking limestone as coarse aggregate for portland cement concrete. These aggregates are not expected to last more than 20 years in portland cement concrete pavements.

The recycling project in Lyon County was immediately south of Rock Rapids on Highway 75. This was an old portland cement concrete paving construction in the early 1930's. It was constructed 18' wide with integral curb. In the early 1950's the curb was removed and the roadway was widened with portland cement concrete to 24' wide. Then about 1964 the roadway was overlaid with 3" of asphalt concrete. This section of roadway was being removed at two separate locations in order to raise bridges to provide for adequate drainage capacity. This provided us with four separate test sections; one section at the end of each of the two bridges. The contractor used a backhoe to remove the asphaltic concrete and load it for hauling to the plant site. The portland cement concrete was then broken up with a pneumatic punch or chisel into large chunks 2-3 square feet in area. These were hauled to the same plant site for further crushing. We estimated that approximately 80-85 percent of the broken concrete was recovered from the breaking operation. The finer pieces were left on the grade because of the danger of picking up high percentages of soil with the small pieces of concrete.

The major problem encountered on this project was the removal of reinforcing steel from the broken concrete. These were two longitudinal #5 bars in the area of the curbs on each side of the roadway and two longitudinal bars running parallel near the centerline. The contractor used hydraulic powered shears to clip off all protruding steel during the removal and loading of the concrete on the grade. Some additional steel was removed from the concrete prior to crushing at the plant site.