OFFICE **MEMORANDUM** ... DMSION OF OPERATIONS & MAINTENANCE

TO: File **DATE:** September 23, 1985

FROM: Tor Lyshaug

SUBJECT: Surface Management System

Multnomah County has had a surface management system in operation since 1976. This was a system that was developed in house, in the Division of Operations and Maintenance, which is in charge of maintaining County roads, bridges, fleet management, communication, traffic control, signs, and; until recently, the Inverness Sewage Treatment Plant.

The important part of the surface management system is that you recognize that the asphaltic concrete surface"that is laying out there on County roads is a resource, and a resource of some substantial magnitude when you realize, for instance, on the 920 miles of roads that was Multnomah County's road system prior to the recent annexation by the City of Portland, we had an estimated source of 13 million tons of asphalt. We were able to convince the County politicians in the middle 1970's that the maintenance of county roads was imperative and tbat a program was necessary to develop so that we would have a system that would sustain the wear and tear on the road net and prevent it from going beyond destruction, and into reconstruction, which, of coursc, costs eight to ten times as much as planned maintenance.

As a part of this program, we developed a so-called paving train, where a multiple of units grind the asphalt that needs to be repaired, picks up the grinding, lays down the new asphalt, and thus, we cut down substantially on the time and the cost of so-called old "plug-patching".

Another development by the County, ~s that we very early recognized the value of old asphalt that was normally hauled to the dumps and wasted. In the 'middle 1970's, we incorporated in County contracts that asphalt that was to be removed from County roads should be hauled to designated areas determined by the County and stockpiled. This was something that the contractors, to begin with, really thought was a blessing because it solved a disposal problem. However, in later years, when they discovered the value of the salvaged asphalt, the whistle has somewhat of another tune.

Throughout the years, the County has through this process, accumulated substantial stockpiles at their Vance Pit site, of recycled asphalt. Every year, we crush in the neighborhood of about 25 to 30,000 tons and we have been using this material fOT repair of shoulders, subgrade improvements, or almost anything where crushed aggregate is needed. This has allowed us to cutdown substantially on the necessity for mining rock in the Vance Pit area and has extended the use of the resource.

In the last couple of years, we also have experimented with mixing the crushed asphalt with emulsified asphalt and placing it on the roads with a tailgate paver. Specifically, we have been using a Layton tailgate paver.

The results from these experiments over the last couple of years convinced us that the way to utilize recycled asphalt, is not necessarily to blend it with virgin hot asphalt, which, however, is recommended, and we allow in our contracts, or use the heater scarified method, which has been used with substantial success allover the country, but requires also a large amount of heat energy. By studying other approaches by other agencies, and our own expe~ience with emulsion, we were convinced that by using an additive, a softening agent, such as cyclogen, we could come up with a surface product of asphalt concrete that would be acceptable and e~onomical for roads·~th medium traffic density. We, therefore, budgeted for a pugmill that was equipped with a belt scale and also had a metering device where we could control additives to do the necessary development and experimental work in utilizing cold recycled asphalt in this area.

Our stockpiles of crushed asphalt indicate that the average amount of asphalt from samplings is about 5.2% residual asphalt. However, the "fines" in the aggregate is substantially increased due to the crushing process, and probably also some contamination. When we sent our test samples to Whitco for evaluation for additives, they came back with the recommendation that we would need to add approximately 3% - 3.2% cyclogen to the material. When you realize that cyclogen costs us $1.38per gallon, the cost of cyclogen per ton of mix for 3.2% amounts to $10.64 and for 3% additive, $9.98. In other words, each 1/10 percent of cyclogen adds 33 cents per to~ to the cost of the cold recycled asphalt. For this reason, we decided to do some substantial field experimentation in our pit, where we actually mixed different batches of asphaltic concrete and we varied the additive~ clear from 1% up to 3.5% of cyclogen. These different batches were placed with a lay box, compacted and evaluated. With the lower percentage of asphalt additives, we encountered a substantial problem of rolling, and also segregation. We, therefore, decided to add moisture to the mixes, and that seemed to improve the workability as well as less segregation. However, with the lower percentages around 2 to 2-1/2% cyclogen, we still had a substantial amount of rolling problems. We then decided to add, as an experiement, Condor SS to the moisture with the intent to try to stablize the mix because of the additional fines that the recrushing of asphalt had created. We used one gallon for each 300 gallons of water as a base for our addition of moisture to the mixes. We found that by using Condor SS we eliminated the large portion of the segregation and we got a mix that immediately upon being placed, was substantially more stable than we had encountered previously.

We also found that without any question, we could reduce the cyclogen to 2%. With this as a background, we started our paving program for this

year with recycled asphalt, and our first project was S. E. 267th Avenue east of Gresham, where we placed approximately 600 feet. Through a mix-up of numbers, we only used 1.6% cyclogen in this mix. We placed 108 tons to a depth of 1-1/2 inches and with Condor SS in the mix.

We also tacked the road with CRS 2 and we used the Barbur Green paving machine to lay it down. It turned out, however, that to our own surprise that the pavement met our requirements for density and finish in spite of the low cyclogen content. On July 30, 1985, we paved S. E. Clark Road from S. E. Bluff Road to a point 1681 feet southerly. We placed 406 tons. We used 2% cyclogen and the depth of the pavement was 1-1/2 inches. On July 31, 1985, we paved S. E. McKinley Road from Jenny Road approximately 2,700 feet easterly. We placed 576 tons.

Throughout the month of August little over 10,000 tons of recycled asphalt was placed. We discovered, however, that we can safely reduce the cyclogen content to 1.8% and we have paved N. W. Gilkison Road, N. W. McNamee Road, with this mix. Since, we have later learned that the State has had substantial success with a new emulsified asphalt designated as CMS 2S. We have one project on-going where we are laying down three panels, one ~th cyclogen as an additive with Condor SS, onewtth CMS 2S and Condor S8 added to the moisture and finally, one panel with CMS 2S without Condor added to the moisture. The result of this experiment obviously is not available because it will be completed this week, September 23 - 28.

We have observed that the addition of Condor S8 in the moisture that we add to the asphaltic concrete mix improves upon the product in several ways. It has allowed us to immediately behind the paving machine use our dump trucks that are loaded with asphalt for traveling. This, of course, allows us then to use the lanes just paved instead of haVing to travel on tacked road. It also seems that th~'rains we have occa~ionally during the operation, do not cause as much damage as,anticipated.

The addition of the cyclogen to the asphaltic concrete mix has substantially reduced the cost of the additive. When you realize that 3.2% would cost us $10.64 and 1.8% costs us $6.01, one can easily recognize the economy of adding 44 cents of Condor 85 to the moisture to obtain this kind of saVings.

It should also be noted, that by adding the Condor 5S, we seem to achieve maximum density for the compaction at a much earlier time. We have chipsealed some of the roads immediately the day after paving with apparently no adverse effects. We realize that there is anawful lot left to be learned about the use of softening agents, additives such as Condor 5S in dealing with cold recycled asphalt, but I think the progress that we have made in MultnomahCounty during this season is noteworthy and should be of help to other people in the industry.