REGION OF OTTAWA CARLETON — REPORT
RÉGION D'OTTAWA CARLETON — RAPPORT

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TO/DEST. Co-ordinator Transportation Committee

FROM/EXP. Director Infrastructure Maintenance Division
Environment and Transportation Department

SUBJECT/OBJET **RECYCLED ASPHALT PAVEMENT (RAP)**

DEPARTMENTAL RECOMMENDATION

That the Transportation Committee receive this report for information.

BACKGROUND

The two prime constituents of asphalt pavement, the aggregate (stone) and the binder (the black material that holds the pavement together), are both non-renewable natural resources. As such an ability to reduce, reuse or recycle these materials is very desirable.

Major benefits, in addition to preserving these non-renewable resources, include reduced air pollution, less energy consumption, reduced social disruption and reduced exposure of the public and workers to safety hazards. These benefits accrue from a reduction in materials processing, manufacturing, transportation, construction and maintenance.

DISCUSSION

The Environment and Transportation Department has expended considerable effort in recent years in seeking out and exploring technologies to reduce, reuse and recycle asphalt pavement material. Starting with the pioneering of Cold-in-Place Asphalt Recycling about 10 years ago, the Department now has nine distinct strategies to maximize environmental benefits in this area. Six of these strategies have been introduced in just the last two years. The following table summarizes these approaches:

Pavement Strategy	**Year Introduced**	**Description**	**Estimated Tonnes of Recycled Material Last Two Years (1997/1998)***
Cold-in-Place Recycling	1989	Recycles existing surface course material as a new base course	56,000
Granular Road Sub-Base with a percentage (currently 25 %) of RAP	1996	Up to 25% of the gravel road sub-base may be recycled asphalt	8,000
Base Course Asphalt with RAP	1990	Up to 30% of the base course lift of asphalt may be RAP	5,500
Hot-in-Place Recycling	1997	All of the existing surface course asphalt recycled on site	45,000
RAP as a shouldering material	1997	100% RAP used in lieu of virgin granulars. First application being evaluated. Looks promising.	400
Ultra Thin Resurfacing (NOVACHIP)	1997	Thin resurfacing asphalt product that requires less milling	8,600**
Deep Cold-in-Place Recycling	1997	All of the existing surface course and base material recycled on site	22,000
Surface Course Asphalt with RAP	1998	Used on experimental basis on one project. Monitoring.	1,500
SUPERPAVE Asphalt with RAP	1998	RAP was used in a SUPERPAVE Pavement on new road construction (Conroy Road)	800

*A typical truck transporting asphalt holds 22 tonnes of material. The amount of material recycled in the last two years by the Region of Ottawa-Carleton (almost 150,000 tonnes) represents over 12,000 fewer heavy truck trips to and from job sites.

**This strategy reduces the amount of material "wasted" from the project, i.e. reduces the amount of RAP produced by 70%.

In the last two years (1997 and 1998), almost 60% of the Region's resurfacing work utilized the above-noted reduce, reuse, and recycle paving strategies.

In addition to the above, the Region uses smaller quantities of RAP for temporary detours, snow disposal site haul roads and some temporary patching work.

Analogous to the medical field, the above-noted strategies (prescriptions) are not generally interchangeable with each other. The particular recycling strategy chosen from the above-noted table or the selection of non-recycling strategies (i.e., mill and overlay, overlay only, NOVACHIP, the use of specialized pavements such as Stone Mastic Asphalt etc.) depends very much on the specific nature of the project being undertaken and takes into account traffic loading, structural

adequacy of the pavement structure, the extent of surface cracking and other defects, the type of existing materials (not all pavements are the same), whether the project is in an urban or rural setting (curbs, iron work and drainage considerations as well as equipment manoeuvre room) etc.

Perhaps the most important environmentally responsible pavement strategy employed by the Department is one not listed in the above-noted table. This strategy involves designing and constructing pavements that will have as long a service life as possible. This is another area where the Department has expended considerable effort and has resulted in the Region being one of the first municipalities in Canada to implement the new SUPERPAVE, NOVACHIP, "fifth generation" Hot-in-place and other technologies. Many of these initiatives, if implemented properly, can add years to pavement life. For example, research has shown that each 1% improvement in quality control on pavement construction can extend pavement life by 10%. Another example is the use of SUPERPAVE asphalts, which can increase pavement life by 30%.

However, the key to all of this is quality of materials and workmanship. The Department's objective is to encourage the use of RAP as much as possible. However, this material must meet certain minimum standards or the life of the resulting pavement product is jeopardized. Some RAP stockpiles owned by contractors may not meet minimum standards (granular gradation, contamination with organic substances etc.) without further processing. The use of materials that would reduce pavement life would mean the Region would have to resurface more often to keep a roadway from deteriorating to the point of needing complete reconstruction. More frequent resurfacings are disruptive and costly. They also expose workers and the public to safety hazards and are environmentally unfriendly (energy, pollution, fuel, etc.).

The use of unprocessed RAP material to construct road pavements has been compared to trying to manufacture paper or plastic products from garbage that has not undergone some material segregation. In essence, it cannot normally be done without prohibitively affecting the quality and/or the cost of the end product.

To minimize contractors' processing costs, Departmental staff have on a number of occasions advised contractors to keep their "good" RAP separate from the "poor" material. The Region, through its Materials and Testing Laboratory, has the technical capability of detecting the use of unsuitable material in paving projects and, because of the negative effect on the eventual life of the pavement, any such material is rejected.

One example of too much RAP reducing pavement life is use in the granular road sub-base. These granular layers should be free draining to ensure that water does not get trapped in the road structure. Too much RAP, with its high asphalt content, results in an impermeable layer that prevents the free flow of water. This water weakens the strength of the pavement structure thus significantly increasing the road's susceptibility to damage from heavy loads (trucks and buses) and, when it freezes, the huge expansion forces created literally blow the road apart. Also, the water, blocked from its intended drainage course, may find alternate paths and end up undermining the road itself.

The use of too much RAP in the pavement or the use of RAP that does not meet minimum quality control specifications would easily undo all the significant gains that the Region has made in

recent years with respect to pavement life-cycle. Poorly performing pavements also require more frequent and costly "routine" maintenance (e.g., pothole repair etc.) between resurfacings and are negative features for the community in general.

In summary, it is staff's belief that few municipalities anywhere have done more or are doing more than the Region to identify and apply technologies designed to maximize the life of its pavements while, at the same time, for environmental responsibility, being actively involved with developing and implementing ways to reduce, reuse and recycle as much RAP as possible.

Approved by
L.A. Ross, P. Eng. on behalf of the
Director Infrastructure Maintenance

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