

### ***What is a Bituminous Wearing Surface?***

A bituminous wearing surface can consist of a bituminous spray seal or a hot mix asphalt overlay.

A bituminous spray seal consists of a hot mixture of bitumen and kerosene that is sprayed on the road surface by a tanker to form a thin waterproof membrane. The bitumen is then covered with a thin layer of aggregate with tip trucks. The aggregate is then embedded into the bitumen by rolling with a multi wheeled roller to form a skid resistant surface. The sealing aggregate consists of blue metal particles with a nominal diameter of 7mm, 10mm or 14mm. Crumbed scrap rubber or polymer can be added to the bitumen to provide greater flexibility and strength.

A hot mix asphalt overlay consists of a hot mixture of bitumen, aggregate, sand and rock dust that is spread in a thin layer on the surface of the road pavement by an asphalt paving machine and then compacted with a vibrating steel drum roller. The hot mix asphalt overlay is typically placed in a layer of 25mm to 40mm thick. There is an open graded hot asphalt mix that provides improved skid resistance and drainage and reduced road noise. Open graded asphalt has no sand and rock dust in the mix and therefore is more porous.

### ***What is the Function of a Bituminous Wearing Surface?***

The bituminous wearing surface (hot mix asphalt overlay or bituminous spray seal) on the road pavement performs the following functions:

- The seal forms a waterproof barrier to prevent the road pavement and subgrade from becoming wet, i.e. prevents the formation of soft spots in the road pavement.
- The seal provides a wearing surface to protect the road pavement, i.e. prevents the formation of potholes, wheel ruts and corrugations in the road pavement.
- The seal provides a safe skid resistant surface for vehicles to travel on.



## ***Breakdown Maintenance***

Breakdown maintenance is where the road network is allowed to deteriorate to the extent that significant failures are allowed to occur in the road pavements prior to periodic maintenance works (reseals) being carried out. In this situation the road surface is rough and unsightly. Breakdown maintenance is a high risk strategy particularly on rural roads where there are high vehicle speeds. There is a substantial risk that casualty accidents may occur due to vehicles losing control on sections of rough or slippery roads.

Usually it is necessary to carry out ongoing routine maintenance works, such as patching potholes and digging out soft spots, to keep the road network in a safe condition prior to a reseal being carried out. The short term savings that would be realised by reducing the periodic maintenance program (reseals) would be required to be provided for routine maintenance which will increase at an exponential rate as the road network ages.

When the road pavement is scheduled for a reseal it is often necessary to carry out substantial pavement maintenance works, such as asphalt regulation and major patching and partial pavement rehabilitation works, to prepare the road pavement for resealing. The road may deteriorate to such an extent that the road pavement requires rehabilitation and reconstruction due to the roughness of the road pavement.

Australian Accounting Standard 27 requires municipalities to provide for the depreciation of infrastructure such as roads in the annual financial report. This financial reporting procedure enables municipalities to monitor if sufficient funds are being provided for the replacement and maintenance of assets. At this time, Latrobe City is able to write off the value of the road network over a 60 year period due to Council providing adequate funds to implement a comprehensive preventative maintenance program to extend the life of the road pavements. If a pavement breakdown maintenance system was adopted, Council may have to depreciate the road network over a 20 to 30 year period.

The letter dated 17 October 2000 from Mr Bob Cameron MP, Minister for Local Government indicated that municipalities will be required to report on ten statewide performance indicators. The performance indicator for infrastructure will require municipalities to report on capital expenditure per assessment for:

- capital renewal of existing assets which increases the service potential or extends the life of the asset;
- capital expansion which extends the standard of an existing asset at the same standard as currently enjoyed by residents of a new group of users;
- capital upgrade which upgrades the standard of an existing asset to provide a higher level of service; and
- expenditure that will increase the life of an asset.

Therefore it is important that periodic maintenance such as bituminous spray seals and asphalt overlays be carried out at regular intervals to reduce the rate of depreciation and increase the life of Latrobe City's road assets.

### ***Hot Mix Asphalt Overlays***

CBD streets, industrial roads, roundabouts, and small court bowls are currently resurfaced with a hot mix asphalt overlay.

The benefits of a hot mix asphalt overlay compared to a bituminous spray seal are as follows:

- An asphalt overlay has a stiffer finish that is suitable for resisting the scuffing action of turning traffic or the shoving action of braking traffic at roundabouts, industrial roads and court bowls.
- An asphalt overlay provides a longer life cycle, i.e. 15 years compared to 10 years.
- An asphalt overlay has a smoother finish that is suitable for providing a play area for roller skates and scooters.
- An asphalt overlay has a clean finish that is suitable for areas with high pedestrian traffic such as CBD streets.

In some situations where there are gravel pavements, rather than crushed rock pavements, it is not appropriate to resurface a street with asphalt due to cracks forming in the asphalt wearing surface. Significant cracking of the asphalt wearing surface has occurred in some residential streets that have been resurfaced with asphalt eg. Kosciuszko Street, Stockdale Road, Catterick Crescent, and Chenhall Crescent in Traralgon. Asphalt wearing surfaces are porous and allow the ingress of water into the road pavement causing the road pavement to crack and rut. In the above situation a strain alleviating membrane interlayer (SAMI - bituminous spray seal) should be applied to the road surface prior to the surfacing of the road pavement with asphalt to prevent the ingress of water into the road pavement and to resist fatigue cracking. A SAMI seal would be an additional cost of \$2.50 per square metre.

There have been instances where the resurfacing of the road with an asphalt overlay has caused vehicle access problems where cars are scraping on the road surface. The above situation has occurred mainly in old housing commission areas where there are steep nature strips and crossfalls on the road pavement. To overcome the above problem the existing bituminous wearing surface is removed with an asphalt profiler prior to the hot mix asphalt being laid. Asphalt profiling would be an additional cost of \$2.50 per square metre.

### ***Alternatives to Hot Mix Asphalt Overlays***

In recent years alternative surface treatments have been trialed to find a more economical resurface treatment to replace a hot mix asphalt overlay.

One treatment trialed has been a slurry seal. A slurry seal is a mixture of rock dust, cement and bitumen. The slurry is a self leveling material that is spread on the road by augers at the rear of a tanker truck and finished by hand with squeegees. A slurry seal costs about \$3.00 per square metre. Slurry seals have been carried out at Bayley Drive, Barbor Court, Ambrose Avenue, Garden Grove, Browett Street and Brookes Street service lane at Traralgon, Watmor Avenue, Ruby Street and Bardon Street at Morwell and Baranbali Court and Bond Court at Churchill. The treatment appears to be brittle and crocodile cracking has formed in a number of the above streets.

The other alternative treatment that Latrobe City has trialed is a NovaChip. A NovaChip is a thin layer of open graded asphalt that is laid over a waterproof bitumen emulsion membrane by a specialised asphalt paver. A NovaChip costs about \$5.00 per square metre. NovaChips have been carried out at Head Street, Dodd Court, Rocla Road, Argyle Street at Traralgon and Garden Street, Chickerell Street and Minchington Road at Morwell. The treatment at this time appears to lack the durability of asphalt because heavy traffic has unravelled the surface in sections adjacent to driveways.

The slurry seals and the NovaChip surface treatment will be monitored further to evaluate their long term effectiveness.

### ***Bituminous Spray Seals***

Rural roads and urban roads other than CBD streets, industrial roads, small court bowls with a diameter less than 16 metres and roundabouts are currently resealed with a bituminous spray seal.

The benefits of a bituminous spray seal compared to a hot mix asphalt overlay are as follows:

- Bituminous spray seals are the most cost effective treatment for resurfacing roads.
- A bituminous spray seal is more flexible and can resist fatigue cracking.
- A bituminous spray seal provides a waterproof wearing surface whereas a hot mix asphalt overlay is porous.
- The application of a bituminous spray seal causes less disruption to residents, i.e. 15 minutes compared to delays of more than one hour.
- Less greenhouse gases are produced in the application of a bituminous spray seal.

A SAM seal (Strain Alleviating Membrane) or a two coat seal is applied to a road where there is a risk that traffic will cause stripping of aggregate. It is harder for traffic to strip the aggregate from a SAM seal because the binder is more elastic than conventional bitumen due to crumbed scrap rubber or polymer mix with the bitumen. A two coat seal consists of a layer of bitumen with large aggregate that is sealed over with another layer of bitumen with smaller aggregate. It is harder for turning traffic to strip the aggregate because of the interlocking between the larger and smaller aggregate. Two coat seals are currently being applied to court bowls with a diameter greater than 16 metres.

A SAM seal or a geotextile seal is applied to a road where excessive fatigue cracking has occurred in the bituminous wearing surface due to heavy traffic such as quarry trucks and log trucks. A geotextile seal consists of geotextile fabric that is fixed to the road surface with a bitumen tack coat and sealed over with a conventional spray seal. Geotextile seals have been carried out at Whitelaws Track, Junction Road, Philip Parade and Quarry Road. The crumbed scrap rubber and the polymer in the SAM seal and the geotextile fabric in the geotextile seal provide the elasticity that enables the bituminous wearing surface to deflect with heavy loads without forming cracks.

### ***Pavement Rehabilitation***

Latrobe City's Design Guidelines for new developments require that urban residential roads are to be surfaced with a primerseal or prime and a hot mix asphalt overlay.

To be consistent with this policy, road pavements in residential areas that have been reconstructed or rehabilitated are currently resurfaced with an emulsion primerseal and a hot mix asphalt overlay. It is difficult to form a smooth finish on a recycled pavement adjacent kerb and channel, and a hot mix asphalt overlay corrects any imperfections in the surface of the road pavement to provide a smooth riding surface.

### ***Development of the Reseal Program***

The following procedure is followed to develop an annual reseal program.

First a search of the Pavement Management System is carried out to identify potential roads that may require resealing. The criteria used to identify potential roads for resealing are age of the resurfacing treatment, brittleness of the bitumen and the extent of cracking and patching in the bituminous wearing surface.

An inspection of the roads identified by the pavement management system is carried out to evaluate the current condition of the bituminous wearing surface. The inspections are generally carried out in December and January. The criteria used to evaluate the bituminous wearing surface are : brittleness of the bitumen, the extent of cracking and patching in the bituminous wearing surface. The brittleness of the bitumen is the major criterion that indicates that the road requires sealing. If a seal is identified as having a high level of brittleness in the bitumen then it needs to be resealed before cracks develop and allow water to ingress into the road pavement. Cracking is also an indication that the bitumen has become brittle. The brittleness of the bitumen is tested by removing aggregate from the surface of the bituminous spray seal and checking if the bitumen is tacky.

After the inspections are carried out the list of roads is prioritised on the above criteria to determine the reseal program for the next financial year.